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ATLANTA'S INVITATION TO AMERICAN COTTON MANUFACTURERS ASSOCIATION.

On October 8th the governing board of the American Cotton Manufacturers Association will be called together at Charlotte, N. C., to select a city in which the 1910 convention of the Association will be held.

The city of Atlanta, through its acting mayor, the president of the Chamber of Commerce and through the governor of the State of Georgia, has extended its heartiest invitation to the Association to hold its meeting in that city in 1910.

The invitations were in no sense perfunctory. They were written with all the promise of welcome that Atlanta knows so well how to provide. They also went with the warm endorsement of prominent Atlanta citizens; men who have promised their aid in every way that will help to make the visit of the invited guests pleasant and enjoyable.

With all her heart Atlanta has extended her invitation, and awaits the happy news of its acceptance.

To the man who has not visited Atlanta for some years the city's growth will be of special interest; the population approximates 175,000 people. The transportation facilities are not excelled. The hotels are large, comfortable, and of sufficient number to give most excellent accommodation to the largest possible attendance at the convention.

Atlanta's many clubs have a well known reputation for hospitality and their doors will swing wide to entertain the Association's members, their visitors, their wives, and friends. Should it be desired to hold an exhibition of textile machinery in connection with the convention, Atlanta's new auditorium would offer the largest and most commodious quarters in the South.

Atlanta's historic interest, the comfort assured, the promises made, and the heartiness of the invitation, will all, we hope, be so persuasive that the governing board can not decline.

THE ART OF WEAVING.

Weaving is one of the oldest and most important arts of which there is any record. Some authorities place the existence of the art as far back as 4,000 years. The Bible probably gives the most authenic information regarding the existence and development of weaving among the ancients.

The ancient Egyptians practiced the art with a skill and cunning that seems almost beyond comprehension. In those early periods, with their crude instruments for producing cloth, the art was centered in the weaver entirely, and it was only by his dexterity and skill in that line of work that such beautiful effects were obtained.

The "vestures of fine linen" worn by Joseph were made by the Egyptians and represented the quality of the fabrics that could be made at that time. Some remnants of these cloths are still in existence and are said to be equal to the finest cambric of present day production. The Israelites had acquired the art to a certain extent, before their sojourn in Egypt. It is probable they learned a great

deal from the Egyptians and became very proficient in making some of the elaborate and costly hangings of the Tabernacle.

Weaving among the early Egyptians and Jews was carried on chiefly by the men. However, this work later came to be performed by women. The Bible does not give a description of a loom, but several parts are alluded to in different passages. The beam is spoken of, to which the warp was attached, and a pin to which the cloth was fastened and on which it was wound. The term shuttle is also mentioned, and had reference to the form used in those days. From the earliest times to the fourteenth century the warps were placed perpendicularly and the cloth woven downwardly. The history of the development of weaving parallels the history of civilization, and indicates the close relationship existing between them. As civilization progressed, increasing demands were made upon the weaving industry which never failed to respond. The weaving Renaissance may be said to have occurred in the eighteenth century, when the industry was completely revolutionized by the invention of the power loom as a practical mechanism. Previous to this, in 1678, a Frenchman named De Gennes invented a type of power loom which proved unsuccessful.

The first fly shuttle was invented by John Kay in 1733, and was followed in 1760 by his invention of the drop-box.

The introduction of the spinning spindle about 1775 awakened a vast amount of interest in the entire textile industry. Dr. Edmund Cartwright, an Englishman, was very much impressed with the developments in the industry and proceeded to design a power loom which he completed in 1785. The loom did not attain practical usefulness until the expiration of his patent, and from a financial standpoint, it was a distinct loss to him.

In 1745, Vancauson, a Frenchman, further developed a needle machine which had its inception at the hands of Bauchon and Falcon. Owing to the lack of knowledge regarding the fly shuttle, the machine was not completed. The completion and success of the loom was due to the efforts of Joseph Marie Jacquard, of Lyons, France, and the machine still bears his name. He was born at Lyons in 1752. His father was a weaver, but the son did not follow that work very long. He was engaged in the printing trade for a time and finally went to the war with the French army. Returning in 1793, he began work on his loom which when completed proved a great success. He incurred the hostility of the Lyons weavers by the introduction of the new loom, and his life was in danger many times.

In 1806 the invention was bought by the State and become public property. Jacquard died in 1834, and in 1840 a statue to his memory was erected at Lyons. Weaving machinery has been constantly improved in design and efficiency, although the fundamental principles have remained unchanged. All looms, except the Jacquard, were operated with cams for shedding, previous to 1837 when William Crompton, of Taunton, Mass., invented the first dobby head for weaving fancy cloths. Improvements to shuttle-box mechanisms were made by E. W. Brown in 1854. Later in 1857 L. J. Knowles, of Warren, Mass., invented another shuttle-box mechanism.

No radical changes were made in the construction of looms until 1895, when James H. Northrop perfected a filling-changing mechanism for looms, which has since become celebrated, and has revolutionized, to a great extent, the plain weaving industry of the country.

Improvements are being constantly made to weaving machinery, and fully 500 patents are issued yearly on some new device or arrangement for looms. The high state of perfection of weaving machinery to-day may be only a precursor of what may be developed as the years go by.

CROP FIGURES FOR 1908-09

Complete data on the commercial cotton crop of the United States for the year ending August 31, 1909, has been given out by Secretary Hester, and shows that the total crop amounted to 13,825,457 bales. It has the distinction of being the largest cotton crop ever recorded, and approximates very closely the estimates made in this paper in September of last year.

Taking into consideration its chief characteristics of grade, body, and spinning qualities, the crop is considered one of the finest ever raised. The crop was moved to market in greater volume than ever before, and by the end of December over 8,500,000 bales were delivered to customers. This represented an excess of nearly 700,000 bales at that time over any previous year. The average price of 9.45 cents per pound for middling was about two cents below the average price of last season's crop. The lowest price reached was $8\frac{11}{16}$ cents on December 15, 1908, and the highest price on July 14, 1909, when $12\frac{5}{8}$ cents was recorded. The quality as a whole was superior to last season's crop, and graded strict middling compared with middling a year ago. Conditions were most favorable to the spinner, on account of the low price for the greater part of the season, and because of the splendid spinning quality of the staple.

The monetary value of the crop amounted to over $680,000,000 exclusive of the seed, and ranks second as the most valuable of record. This fact has exerted a most helpful influence in the recovery of business conditions to a more normal state than we have had for some time. The great crops of the country were the keynote to restored confidence, and failure of any of them would have worked untold harm to the progress which has been so conspicuous during the last nine months. Southern mill stocks of the raw material are larger than last year, but can not be called excessive. This year's stock on hand amounts to 259,000 bales compared with 144,000 bales the previous season.

The increased spindleage of the country and the activity of the cotton mills were responsible for a record consumption of the raw stock, which amounted to a total of 5,239,991 bales. This is about 38 per cent. of the entire crop. Of the above figures the North took 2,680,118 bales and the South 2,559,873 bales, showing that the North used about 120,345 more bales than the South. Last season, the South used practically 300,000 more bales than the North.

SOUTHERN TEXTILE ASSOCIATION TO MEET.

The regular quarterly meeting of the Southern Textile Association will be held at Raleigh, N. C., on October 20, the decision as to the location having been made at the last previous meeting at Spartanburg in July. A partial list of the papers to be presented at the coming meeting are: "Care of Operatives' Health," by A. S. Winslow, Clinton, S. C.; "Future of the Spinning Frame," by T. F. Cuddy, Clio, S. C.; and "Humidifying," by W. P. Hazelwood, Atlanta, Ga.

WEAVING.

HISTORY OF WEAVING.

(*Contributed exclusively to* COTTON.)

BY A. E. TUTTLE.

Weaving, which is the interlacing together of two or more series of yarns to form cloth, may be regarded as one of the oldest of arts, as well as one of the most useful. That it was not in its infancy at the beginning of the Christian era is indicated by Biblical references to it, among which may be mentioned the passage recorded in Job: "My days are swifter than a weaver's shuttle."

The old saying "Necessity is the mother of invention" is truthfully illustrated by the different stages of weaving attained by different countries. The art may be said to be universal, being developed to a greater or less extent in practically all parts of the world, differing according to the stage of civilization, the mode of living and the geographical position.

When Columbus reached the shores of this country he found the inhabitants wearing primitive cotton fabrics, the materials of which had been spun and woven by crude methods then in vogue among them.

It would be hard to name a country in any part of the world, whether inhabited by civilized or uncivilized people, where weaving has not been practiced for a longer period of time than they have any record of. The earliest cloths made were no doubt primarily intended for wear, the appearance being of little importance.

A plain cloth illustrated in Fig. 1, is the simplest form of fabric, and would probably suggest itself as being as firm and substantial a fabric that could be obtained with a given amount of material in which one series of yarns was at right angles to the other series of yarns.

Perhaps one of the oldest methods of weaving consisted in stretching the warp on a frame about the length of the piece to be woven, then inserting the filling with a needle or long pointed instrument, somewhat after the manner of darning. This was a very slow and laborious process and is undoubtedly not in use at the present time for weaving plain cloth.

The first improvement on the preceding method probably consisted in drawing every alternate end of the warp through heddles on one shaft so that the warp yarns could be separated with one movement before the filling was inserted. The ends not drawn through heddles remained stationary, while those on the harness shaft were raised above them, and held in this position, while a pick of filling was inserted. These threads were then dropped below the stationary threads for the succeeding pick. Two picks completed the round or repeat.

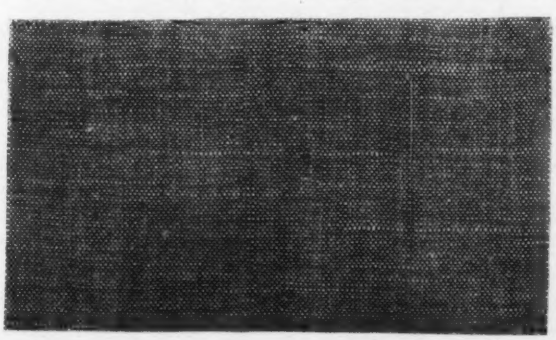


FIG. 1. PLAIN CLOTH.

FIG. 2. PICTURE WOVEN ON A JACQUARD.

It would be at about this time that the reed would suggest itself as a means of separating and keeping the warp yarns at equal distances apart, and for pressing the filling to the fell of the cloth. A shuttle or some instrument for holding the filling was probably used for carrying the filling from side to side.

A logical development of the method of separating the warp yarns would appear to be in providing another shaft for the yarns that previously remained stationary, so that one half of the ends could be raised in succession while the remaining ends formed the lower half of the shed. This principle of shedding is now obtained on single lift dobbies and Jacquards.

When a person tries to conceive the many types of woven fabrics, and the variations of construction or pattern in each type, in vogue at the present day, he soon becomes bewildered. There are thousands of them made with all kinds of materials such as silk, wool, flax, cotton, paper, etc., and in different crossings or orders of inter-

lacing. They range in pattern from the plain cloth to fabrics which rival some of the finest pictures made by the steel engraving process, and from the light, transparent veiling to fabrics designed to hold water, or repel bullets.

A comparison of a plain cloth with Fig. 2, which is a representation of a picture woven with a white warp and black filling, will indicate somewhat the scope of pattern that can be made with the warp yarns running in one direction and the filling yarns interlacing them at right angles. Plain cloths comprise a great many different constructions. In wide cotton goods alone the range is from fabrics that may be passed through an ordinary finger ring to duck that weighs 48 ounces per square yard.

Although hand looms are still extensively used for pattern and fancy weaving in European mills their use in this country is very limited. The simplest of these looms is a great improvement over the manner of weaving in which there is really no loom, as in Fig. 3. This figure represents a Navajo Indian woman weaving a blanket. In the so-called hand looms now in use, the shedding motion, through suitable lever and other connections, is actuated by the feet, while the beating up and picking connections are actuated by the hands of the weaver.

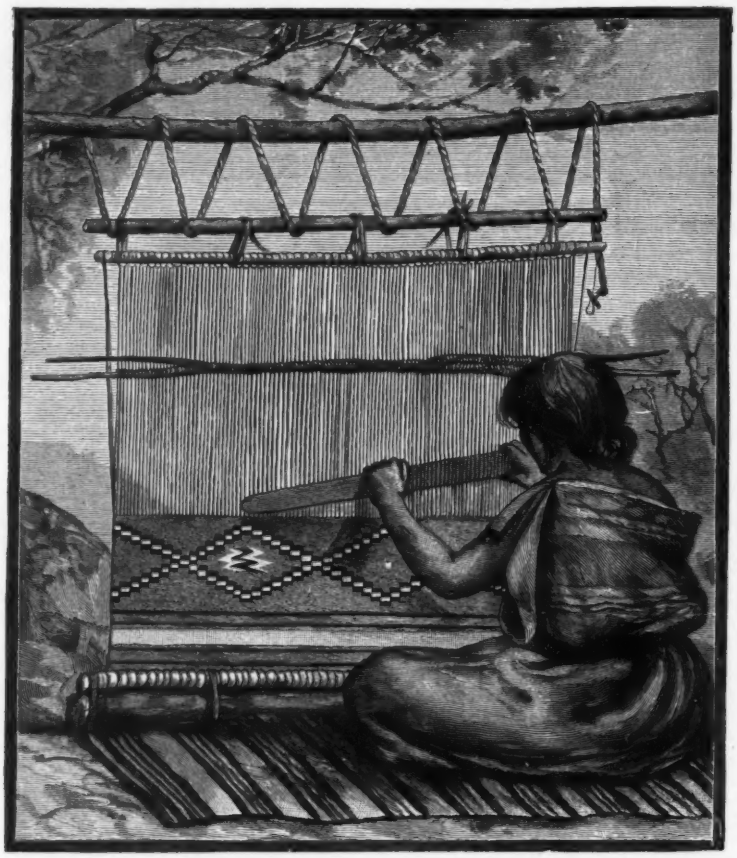


Fig. 3. Blanket Weaving by a Navajo Indian.

HAND LOOMS.

The three principal types of hand looms are as follows:

1. The treadle loom, which corresponds to the cam or tappet loom weaving by power.

2. The witch or single lift dobby.

3. The Jacquard.

Each harness shaft on a treadle loom requires a separate treadle, and as these are actuated by the weaver's feet it will readily be understood that the capacity of the loom is limited.

The development of weaving may be said to date from about 1733, when John Kay placed certain additions to looms then in use, for the purpose of facilitating the control of the shuttle. At that time the method of weaving was exactly as it had been, with slight variations, from the earliest times. The shuttle was thrown through the shed by hand and a weaver could only work a narrow loom. Two weavers were required for one loom if the cloth was wide. One would stand at one side and receive the shuttle thrown by the other weaver from his side.

Kay's invention, illustrated in Fig. 4, consisted in adding a small box A at each end of the race plate, for the reception of the shuttle, with spindles B located above and parallel with them. Suitable provision was made for controlling the movement of the pickers and, incidentally, the shuttles, as shown by the cords D and E, and the handle F. The pickers C, slid along the spindles B and were kept steady by having tongues working in grooves or slits in the bottom of the boxes. The weaver picked the shuttle across by drawing forward the handle F, and by a certain motion of his hand, checked its speed as it entered the shuttle box.

The present day loom pickers on overpick looms work

on this principle. They are, however, usually made of rawhide, whereas Kay's pickers were made of wood.

Kay is often referred to as the inventor of the "fly shuttle," and there is an erroneous impression in some minds that he invented the shuttle itself. An illustration of a hand loom shuttle in general use before his invention is shown in Fig. 5. This shows that the shuttles were then practically the same, in essential features, as those in use at the present day. However, in this old style shuttle, instead of the points being placed in the center of each end of the shuttle, as were subsequently required by the adoption of Kay's invention, they were curved as illustrated, for convenience in throwing by hand.

Immediately following Kay's invention, and no doubt made necessary by it, was the arrangement made for automatically letting off the warp. This is what is known today as the friction let off, consisting of ropes placed one or more times around the collar of the warp beam and held at a tension by weights.

Cloth may be made without either automatic let off or take up motions being on the loom, as is still the case in weaving some types of hand loom goods. When the cloth is not carried forward automatically after the filling has been beaten up to the fell of the cloth, the distance between the latter and the position occupied by the heddle eyes soon becomes too small for the passage of the shuttle, and necessitates the temporary stoppage of the weaving process, until more warp is released and the woven cloth drawn forward.

A book entitled "Weaving and Dyeing," published in 1817 at Utica, N. Y., by J. & R. Bronson, gives the weaving conditions at that date in this country. In it the power loom is not mentioned. A distinction is made between the fly shuttle and hand looms and the improved types of looms are summarized as follows: "Some of these are operated in all parts (except shifting the temples and bobbin or quill) by only moving the laith with the hands to and fro; some are operated by the same method in all parts, except the treading, which is done by the feet; in others the shuttle only is operated by the motion of the laith." The fly shuttle and hand looms were advocated in preference to the improved looms for common use. Comparing the fly shuttle with the hand loom the authors stated: "This manner of weaving is more easy, and attended with less hard labor than that of the hand loom, in particular, from this plan allowing you to sit upright in the loom, whereas in weaving in the hand loom, you have to reach forward to throw the shuttle."

POWER LOOMS.

One of the earliest power loom inventors was an English clergyman named Edmund Cartwright. With practically no knowledge of the weaving methods then in vogue he, in 1785 or 1786, made and patented a power loom. After his patent had been granted he is reported to have said: "I then condescended to see how other persons wove, and you will guess my astonishment when I compared their easy mode of operation with mine." When he had examined other looms he realized that certain features or parts connected with them were in many respects superior to his, which caused him to immediately discard his original loom and build a better one.

Cartwright's second loom formed the basis, in almost every respect, of the modern ordinary plain loom. In it he used cams instead of the weaver's feet in producing a shed in the warp, and arranged a picking motion which was very effective. The driving, or beating up motion was on the same principle as that applied to the most recent power looms. Devices for preventing a rebound of the shuttle after it entered the box, and for preventing smashes when the shuttle caught in the shed, were used. He also introduced new types of let off motions, take up motions,

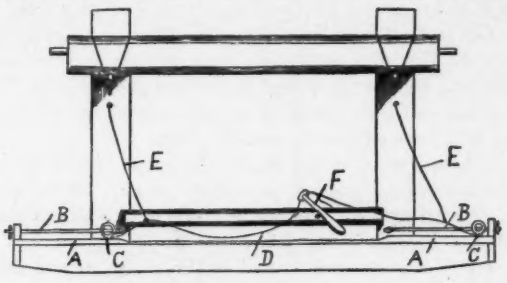


FIG. 4. KAY'S HAND LOOM IN 1733.

and filling stop motions. Some years after his patent rights had expired, Dr. Cartwright applied to Parliament for some compensation for the financial loss he had sustained, on the ground that although he had failed to render the loom commercially successful, it had since become valuable to the public, and he received a grant of $50,000.

The feeling against power looms in general at one time became very bitter, the weavers believing that they would eventually deprive them of a means of earning a livelihood. This feeling resulted in a large number of Cartwright looms, built by two men named Grimshaw, being burned, the fire being of incendiary origin.

Mr. George White, in a treatise on weaving, published in 1846, states that Dr. James Jeffray, a practicing physician in the well-known town of Paisley, Scotland, brought out a successful power loom in 1787 (the year in which Dr. Cartwright brought out his second loom) without being

FIG. 5. SHUTTLE FOR HAND LOOMS.

aware of what was being done in England. In this loom, the shuttle and lay were actuated by the reaction of springs. There were also smash preventers and shuttle checks connected with it. Dr. Jeffray did not take out any patents, and few details connected with his loom have been preserved.

In 1796 Robert Miller, living near Glasgow, Scotland, was granted a patent on a protector arrangement. At about this time H. Horrocks, of Stockport, England, was also developing the loom but on different lines from Miller.

Dr. Cartwright, in describing one of his loom inventions, stated: "There are three essential motions in weaving: (1) the dividing of the threads of the warp (ends) to permit the passage of the shuttle; (2) the movement of the shuttle for picking or carrying the filling from side to side; (3) the movement of the lay or batten for the beating-up and closing in of the filling." The shedding, picking and beating-up motions have, however, to be supplemented by auxiliary motions, more or less elaborate according to the type of fabric required to be woven on them, or according to the extent to which they are intended to supersede manual labor.

SHEDDING.

The shedding motion of the loom plays a most important part in the process of weaving. It controls the elevation and depression of the harness shafts or harnesses in the loom, and consequently the formation of the pattern in the cloth. In cam and dobby looms the harness shafts carry heddles or cords, through the eyes of which the ends are passed on their way from the warp beam to the fell of the cloth. In addition to lifting and depressing the ends, the cords keep them at equidiastance from each other and repeat the design from selvage to selvage. In Jacquard looms the shedding is accomplished by means of neck and harness cords instead of shafts.

The shed may be defined as the angle formed by the separation of the ends to permit the passage of the shuttle. There are four methods of forming a shed, as illustrated in Figs. 6, 7, 8 and 9.

Fig. 6 shows a shed formed by the motion of one shade

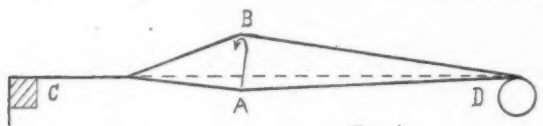


Fig. 6.

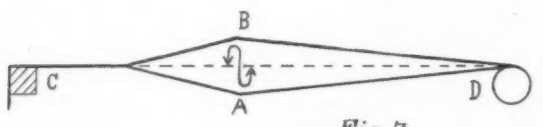


Fig. 7.

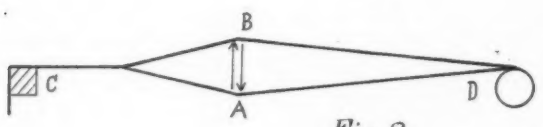


Fig. 8.

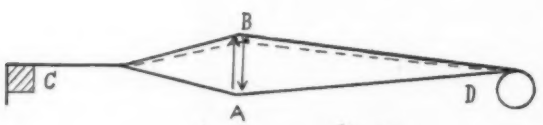


Fig. 9.

Different Types of Sheds.

only and is known as the bottom-closed shed. In the figure, A indicates the bottom or normal position of the ends, B the position of the top shade, C the breast beam of the loom, and D the whip roll. The arrow shows the movement of the ends, of which a certain number travel from A to B and back to A at every pick. There is no actual depression of the bottom shade in making the shed. When at rest or in its normal position, the warp is slightly below an imaginary line drawn, as indicated by the dotted line, from C to D.

In the close-shed, or center-close shed, as shown in Fig. 7, the shades are moved from the center of the shed, indicated by the dotted line, to A and B, and back again at every pick.

The open-shed, as shown in Fig. 8, is so called because the shade is always open, and a harness may remain up for any number of picks in succession if desired.

The semi-open shed, Fig. 9, differs from the open shed only in the top shade not remaining stationary, there being a slight drop, as indicated by the dotted line, at each pick.

The bottom closed shed is one of the oldest types and is usually made by single lift dobbies or witch heads, and single lift Jacquards. It is a defective system at best, its

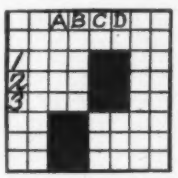


Fig. 10. Weave Diagram.

advantages being counterbalanced by its disadvantages, and it is not now considered an important factor in present day weaving machinery. The excessive distance required to be traversed by the ends in shedding, causes them to be strained more than when other methods of shedding are adopted, and also necessitates the loom being run at a comparatively slow rate of speed.

Its principal advantage is that the ends come to a level after each pick, making it suitable, without special mechanism, for weaving gauze, but the ease with which gauze can now be made on double lift machines is an important factor in making this seeming advantage of no commercial value.

The center close shed is applied principally to heavy woolen and worsted fancy looms of the Crompton type, and is not used on looms for weaving cotton goods. The advantages claimed for this shed are that it places less strain upon the warp, the distance traversed by the yarn being less than with the bottom close shed, and that a rising harness helps to balance a falling one, thereby tending to produce a smoother working of the loom. In both the close and center close sheds the warp yarn comes to a level or central position after each pick, occupying the best possible position for enabling the weaver to quickly make repairs to broken yarn or other defects. However, this style of shed has now been discarded in favor of the open and semi-open sheds, and is built only on special orders.

The semi-open shed is made by double lift dobbies and Jacquards. The slight drop of the yarn in the top of the shed is incident to the movements of the shedding mechanism, the dobby levers or Jacquard griffes dropping slightly from the top position before the action of the rising levers are fully exerted.

In both the open and semi-open sheds, the warp yarns on any harness remain in the top or bottom positions for as many picks as may be necessary for the formation of the pattern, thereby reducing the number of movements of the harness on all weaves but the plain weave. A comparison of the movements required for weaving design Fig. 10, on the close shed and open shed will show the difference very clearly.

Close Shed—Pick No. 1—ends A and B are depressed, and ends C and D are raised. The pick is inserted, then A and B are raised, and C and D are depressed to the warp line. This completes the first pick. Similar movements are required for picks Nos. 2 and 3.

Open Shed—Pick No. 1—ends A and B are depressed, and C and D are raised. The pick is then inserted. No fur-

ther movement of the ends is required for picks Nos. 2 and 3.

The open shed is usually obtained by cams for twill weaving, and possesses advantages which are worth noting. The shed can be made with a minimum amount of power, as a rising harness helps to balance a falling one. In weaves other than the plain cloth, it places less strain upon the warp yarns, because of the small number of movements made, and a corresponding lessening of friction of the warp threads.

The Knowles head motion, illustrated in Fig. 11, produces an open shed, and is used extensively for weaving fancy patterns requiring a large number of harness shafts.

The action of the machine is as follows: Cylinders A and B, which contain teeth covering one half of their circumference, revolve continuously in the directions indicated by the arrows. The illustration shows that the bush C on the pattern chain is directly under the arm D and thus allows the latter to rest in its lowest position. This allows the gear E which is carried on the arm D, to mesh with the revolving gear B. The gear E will thus be revolved half-way around. An arm F is connected to the gear E at G, and receives a backward or forward motion, according to the direction of rotation of the gear E. It receives a forward motion toward the loom in this case. The other end of the arm F is connected to the harness jack H, which will thus be moved to the forward position and a harness connected to it will be lowered. When a ball I on the pattern chain comes under the arm D, the gear E will be raised into contact with the revolving gear A, and will be revolved half-way around in the opposite direction from its previous movement, so that the harness will be raised again. At one point on the gear E, two teeth are omitted. This enables the gear to be kept clear of the cylinders, when it is not moved into contact with them. This allows the harness to remain in either the top or bottom position for successive picks until a change is made by the pattern chain.

SHEDDING.

The character of the movement imparted to the warp ends in forming a shed makes a material difference in the general working of the loom, as well as in the appearance of the cloth. There are only two positions of the warp threads when the shuttle is going across the lay, and as a change of these positions at every pick is found necessary in weaving a plain cloth, the formation of a shed for plain cloth may perhaps be profitably considered. In this connection, the normal positions of the yarn will be assumed to be the upper and lower positions in the shed as in the open and semi-open sheds.

The motion imparted to the ends in forming a shed is as follows: The ends begin to move from their stationary positions slowly and increase in speed to the point where they cross each other, and then gradually decrease in speed until the shed is open again. A pause or dwell of the harness of sufficient length of time to allow the shuttle to pass through the shed, is then given.

The amount of dwell to allow is determined by several factors and is obtained from the shape of the harness cam. If cover is required on cloth made on narrow, fast running looms, ¼ to ⅛ of a pick dwell is sufficient. The amount of dwell will vary on different looms, and different goods, anywhere from ½ of a pick to practically nothing.

The latter is obtained in cam looms by using a perfectly round cam. Although it is not usually considered advisable to use round cams, it is a fact that in at least one of the large mills making the finer grades of fabrics in this country, they have been substituted for cams made to give a dwell, and have proved satisfactory. One of the stated objections to a round cam is that it helps to produce bare or uncovered cloth. The warp yarns are not allowed to remain in a tight condition long enough to enable them to be pulled in the center of the space occupied by the two adjacent ends.

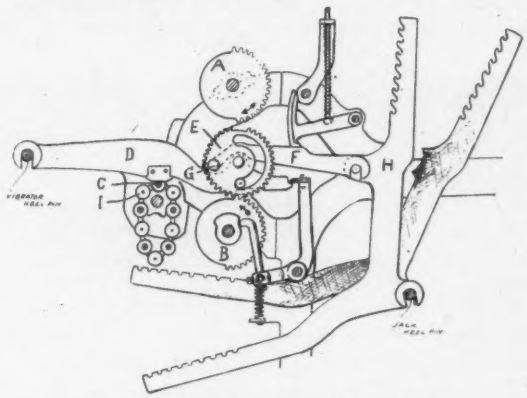


Fig. 11. Knowles Open Shed Dobby.

The shed should be open when the shuttle enters and remain open until it has passed through, not necessarily fully open when the shuttle is entering or leaving but sufficiently open as not to interfere with its free passage, otherwise the yarn at the sides is liable to become chafed or broken, and the shuttle thrown out of the loom.

An early shed has the effect of a strong beat-up, because if the warp yarns are crossed on the filling before the reed reaches the fell of the cloth, they hold and prevent it from slipping back.

The greatest strain on the warp is when the shed is fully open, on account of the greater distance between the back or whip roll and the fell of the cloth occupied by the ends when in this position. The least strain is when the ends are crossing each other. The larger the shed the greater is the proportion of strain upon the ends.

With a view to equalizing the strain on the ends in all positions in the shed, or to reduce the strain to a minimum amount, vibrating whip rolls are used. As the shed becomes fully open, the whip roll, actuated through suitable connections from the crank shaft is made to vibrate or dip slightly, thereby easing the warp. The vibrating whip roll was invented in 1824. It was originally applied to silk looms, and subsequently to cotton and other types of looms.

(*To be Continued.*)

Woolens call for prolonged boiling in dyeing, and the manipulation of the material in the boiling liquor results in the formation of much steam. It is noticeable in different dyehouses that a wide variation exists in the relation between the area of the dyeing vessels and the size of the room.

The highest average wages paid men in the textile mills of North Carolina, for the year 1908, was $2.50.

CAM SHEDDING.

(*Contributed exclusively to* Cotton.)

BY H. A. L.

The three principal motions of a loom are the shedding, picking, and beating-up motions. Shedding is the first operation of the loom in the process of weaving, and may be defined as the proper separation of the warp threads into two planes, previous to each pick, for the insertion of the filling. The proper separation of the warp threads depends entirely upon the woven effect desired in the fabric. We may, therefore, divide the mechanisms used for shedding into three divisions to correspond to the different divisions of weave effects produced.

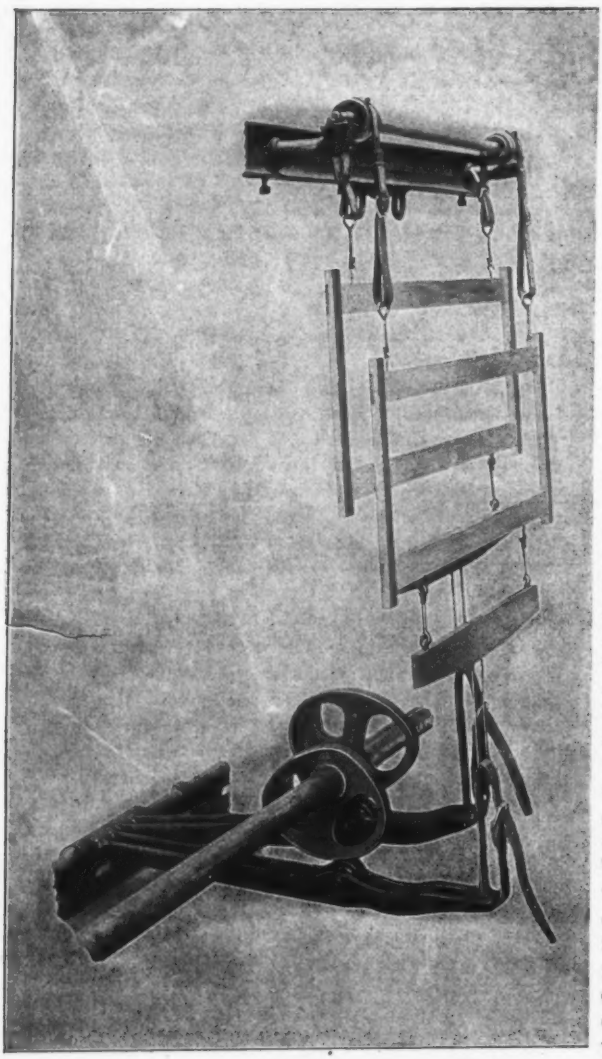


Fig. 1. Mason Two-Harness Motion.

The three divisions are: (1) cam shedding, which is used in the production of plain and small twill effects; (2) dobby shedding, the operation of which produces a large variety of different weave effects, but which effects are necessarily of limited size in the fabric; and (3) Jacquard shedding, which is used for producing the most elaborate all over designs when called for, and also, simpler effects. In other words, a Jacquard begins its usefulness when the dobby reaches its limit.

Cam shedding appears to a casual observer to be a very simple operation, and as a matter of fact, it is not complicated, but a thorough understanding of its underlying principles will aid materially in the economical production of the fabric.

For two-harness work, the harness cams are located on the pick cam shaft which revolves at one-half the speed of the crank shaft. Hence, one revolution of the pick cam shaft represents two picks of the loom. The rigging for a two-harness motion is shown in Fig. 1. It will be seen from the illustration that the cams are set side by side with the heel of one cam opposite the toe of the other. Each cam has a treadle pressing against it on the under side. Facing the loom, the left hand treadle is connected, through a strap and jack, to the front harness. Upper straps connect the harness to the rollers on the top shaft. Another set of larger rollers are used for the top straps of the back harness which is connected to the other treadle by a jack and strap. Hence there is no appreciable lost motion in the connections of the two harnesses, and when one harness is lowered by a cam depressing its treadle the other harness is raised through its connection with the lowered harness.

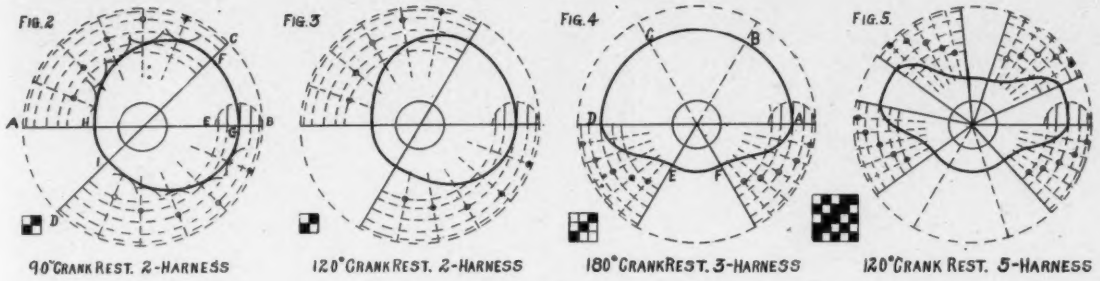
It will thus be seen that the main purpose of the cams is to operate the harnesses for every pick. Each harness makes a complete repeat in two picks, that is, an upward and downward movement. The question of the shape of the cams leads one to ask why an eccentric could not be used, that is, have the surface of the cam circular, with the shaft passing through a hole out of its normal center. It might be mentioned that this style has been used to a limited extent on very fast running looms, but is not suitable for general use. The reason is that the harness not only have to change positions for each pick, but should remain stationary for a short time in order to allow the shuttle to pass through the open shed. In other words, there should be two portions of each cam, which are segments of circles having the cam shaft as the center. The length of time that the harness should remain stationary depends upon the width and speed of the loom and the depth of the shed. The different shaped cams are designated as so many degrees rest of the crank shaft. Thus, we have a 90-degree crank rest cam for narrow width looms running at over 190 picks per minute. A 120-degree crank rest cam is used on looms varying in width from 34 inches to 44 inches and running as high as 190 picks per minute. A 180-degree crank rest cam is used on broad looms 44 inches wide and over. The design and explanation of a cam are best given by means of Fig. 2 which is a diagram of a 90-degree crank rest, two-harness cam, showing how it is drawn.

Every circle contains 360 degrees. It was mentioned that the crank shaft made two revolutions while the cam shaft made one. In other words, the crank shaft will pass through 90 degrees in the same time that a harness cam passes through 45 degrees. This means that the dwell or rest on the perimeter of a 90-degree crank rest cam will be an arc measured by 45 degrees on the cam's surface.

The throw of a harness cam is determined by the actual construction of the loom, as it is evident that the

farther away a harness is from the fell of the cloth, the greater vertical movement it must have to form its shed.

Since the treadles are pivoted in the same line and are



HARNESS CAMS.

operated upon by the cams at the same distance from the pivot, the harnesses successively farther from the fell of the cloth must be actuated by cams of successively longer throw. Experience has proved that an increase of one-quarter of an inch for each cam is about right.

The following terms, to be used in explaining the cams, are defined.

The "toe" of the cam is the circular portion of the cam farthest removed from the cam shaft, and presses against the treadle when its harness is down.

The "heel" of the cam is the circular portion nearest to the shaft, and presses against the treadle when its harness it up.

The "grade" is the name given to the portions of the cam surface lying between the heel and toe. When either of these portions are pressing on the treadle, the harness is changing its position.

Since the harnesses are directly connected to each other, as previously mentioned, and the difference in throw being cared for by passing the top straps over rollers of different diameters, the sum of the distances of treadle plugs from the axis of the cams must be constant. Then the distance from toe to heel in all cams must also be constant.

In a Lowell loom, this distance is six inches, and the throw of the cam is made two inches. Then the radius of the heel is two inches, and the radius of the toe is four inches.

The increased throw of the succeeding cams is obtained by successively decreasing the radius of the heel 1-8 inch and increasing the radius of the toe 1-8 inch.

Referring to Fig. 2 for designing a 90-degree two-harness cam; first, draw a circle of ten inches in diameter. Then draw a concentric circle eight inches in diameter. A portion of this circle will represent the toe of the cam. Then draw a four-inch circle, and a portion of this will represent the heel of the cam. A horizontal line A B is drawn through the center of the circles and another line C D is drawn at 45 degrees with the horizontal line. The part of the eight-inch circle lying between the points F and G is the toe, and the part of the four-inch circle between H and I is the heel.

In order to put the least possible strain on the warp while the harnesses are changing, the latter are given a harmonic motion, that is, they begin to move slowly and increase in speed until they have traveled one-half the required distance; then the speed is gradually decreased until they are stationary. This motion is accomplished by plotting the curve of the cam representing the grade, as follows: On the line A B, plot a semi-circle E B, and divide it into any number of equal parts. The diagram shows six equal divisions. Drop perpendicular lines to E B from these points and use the respective distances to the center as radii for circles. Divide the angles for the grades into the same equal number of parts as the semi-circle E B, and draw lines through the center of the circle. The intersection of the first circle with the first radial line is the center for a small arc whose radius is equal to the radius of the treadle plug. The other centers are indicated by small circles. The tangents to these arcs form the outline of the curve for the grades.

Fig. 3 is a diagram of a 120-degree crank rest, two-har-

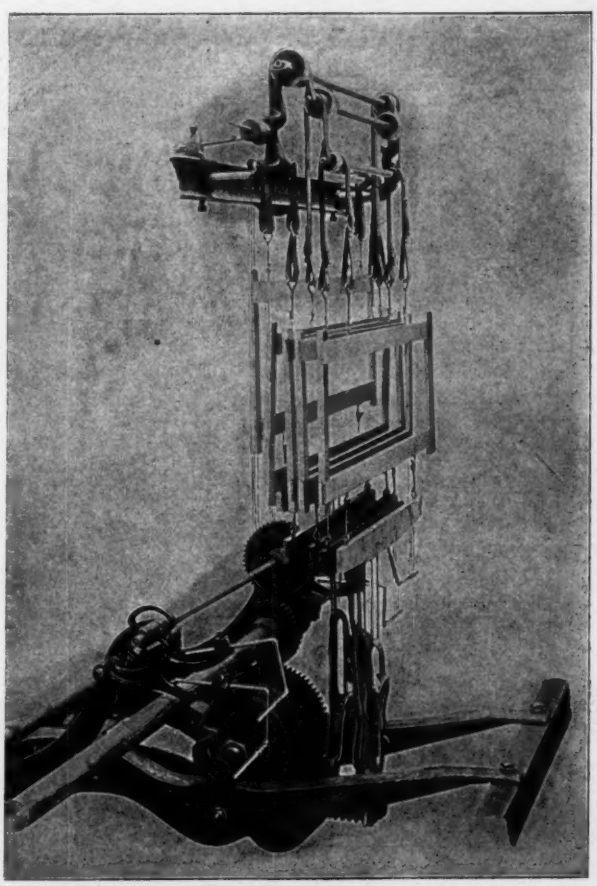


FIG. 6. MASON FIVE-HARNESS MOTION. WITH TAPE SELVAGE MOTION.

ness cam. It is designed on the same principle as Fig. 2, except the angle for the heel and toe is 60 degrees in this instance. The harnesses thus remain stationary longer than in the previous design. This is necessary for wider looms.

Fig. 4 is a diagram of a 180-degree crank rest, three-

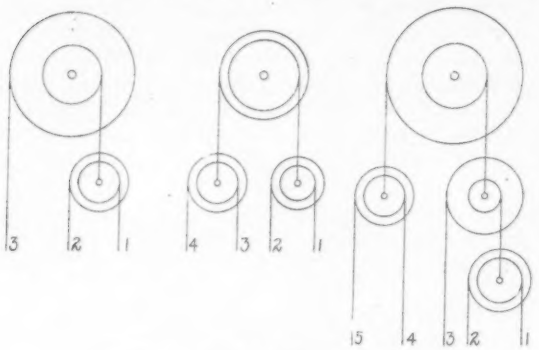


Fig. 7. Top Roller Riggings.

harness cam. In this case, the crank shaft makes three revolutions while the harness cam makes one. The harness cams have to be placed on an auxiliary shaft for shedding any weave over two harnesses.

The 180 degrees of the crank shaft motion equals 60 degrees of the cam, and hence the toe for one pick would be represented by the part A B of the circle in the 60-degree angle. The segment B C represents the changing of the other two harnesses, it being understood that the harness controlled by the cam shown has to stay in the lowered position for two picks. The segment C D represents the time when all three harnesses are again stationary and the shuttle is traveling through the shed. The segment E F is the heel, and raises the harness for one pick. The cam is therefore, designed for a one up, and two down, three-harness twill.

Fig. 5 shows the design for a cam to produce a fancy five-harness twill. The crank shaft in this instance makes five revolutions while the cams makes one. Therefore, 120 degrees of crank equals 24 degrees of cam, and the design is made accordingly. All of the cams in one set have the same outline. Each cam is set one pick back of the succeeding cam.

In a similar manner, any of the cams for the small twills may be designed. and the different shapes easily recognized from a knowledge of how they are designed.

Fig. 6 shows the rigging for a one up, and four down, five-harness twill, with a tape selvage mechanism separate on the loom.

The top riggings of rollers for three, four, and five-harness work on cam looms are shown in Fig. 7 by means of the three diagrams.

Merino wools are easily combined with other qualities of material of short staple, such as rag-wool and cotton, but only a limited success attends the combination of the cross-bred and the merino wool.

Sixty-three per cent. of the textile manufacturers of North Carolina favor compulsory school law, 25 per cent. oppose it, and 12 per cent. are indifferent.

Inquiries about anything pertaining to the textile business will be cheerfully answered by Cotton.

LOOM BOX MOTION.

Multiplier Mechanism. Upper Box Motion Mechanism. Lower Box Motion Mechanism. Timing the Box Motion. Building the Filling Chain.

(*Contributed exclusively to* Cotton.)

BY ERNEST NELSON.

For the weaving of fabrics composed of various colored yarns or different numbers of filling, a box loom has to be used. A box loom is distinguished from a regular loom in that the former is made with two, four, or six boxes on one end and a single box at the other. Some box looms are constructed with two and four boxes at each end, and are known as "pick and pick" looms. When using a loom with two, four, or six boxes at one end, an even number of picks of any one color must be inserted in the cloth, because the shuttle must return to the multiple box end of the lay before a change of filling can be made.

There are two parts to the box motion of a gingham loom namely, the upper and the lower motions. The upper motion consists of a box chain, chain barrel, and multiplier mechanism with ratchets and pawls for driving same. The lower motion consists of a pin gear, a large spaced gear, or star wheel, and fork slides or plugs.

MULTIPLIER MECHANISM.

One bar in the box chain represents two picks. In order to insert a large number of picks of the same color filling without having an excessively long chain, the multiplier mechanism is used. That is, one bar in the box chain will start the multiplier which will work for a certain number of picks, before the box chain is again operated. There are two styles of multipliers, known respectively as the chain multiplier and the disc multiplier. A disc multiplier is used in connection with the Crompton box motion on a gingham loom. A sketch of the mechanism is shown by means of Fig. 1. The motion, as its name indicates, consists essentially of a specially shaped disc and is operated as follows:

The plate A is centered at B, and is given an oscillating motion by a rod C which is operated from the bottom shaft. Each complete movement of the plate A represents two picks. On this plate A is attached a movable pawl D which operates a ratchet E, fast on the same stud with the box chain barrel F, carrying the box chain G. When the pawl D is in contact with the ratchet E, one bar of the box chain is turned, for every two picks. Resting on top of the box chain is one arm of an elbow lever H, centered at I, the other arm of said lever H pressing against a pin in the arm J, and keeping it up out of contact with the ratchet K, when the arm resting on the box chain has no ball in the chain resting under it.

The arm J is attached to the oscillating plate A and is used to operate the ratchet K at the proper time. The ratchet K is fast on the same stud with a multiplier disc L, which has two concaved places on its perimeter, opposite to each other. The ratchet K contains sufficient teeth to make each smooth surface on the multiplier disc equal 12 picks. Secured to a stud M is a finger N which is made to press against the perimeter of the multiplier disc L. An arm O is also secured to the stud M, the other end of which rests under a pin P in the pawl D.

When a ball on the box chain comes under the arm of the lever H, said arm is raised and its other end is lowered, thus allowing the pawl J to fall into contact with the

ratchet K, and turn it and consequently the multiplier disc L. As soon as the multiplier disc begins to revolve, the finger N is pressed outwardly, due to the shape of the multiplier disc, and this movement gives an upward motion to the arm O which in turn presses against the pin P in the pawl D and raises said pawl out of contact with the ratchet E, thus stopping the movement of the box chain.

When the multiplier disc has made one-half revolution, one of the concaved places on its perimeter comes in contact with the finger N which is thus moved inwardly with a consequent lowering of the pawl D into contact with the ratchet E. The box chain will then be turned by the ratchet, and the multiplier ball will be turned from under the arm of the lever H, so that the latter is

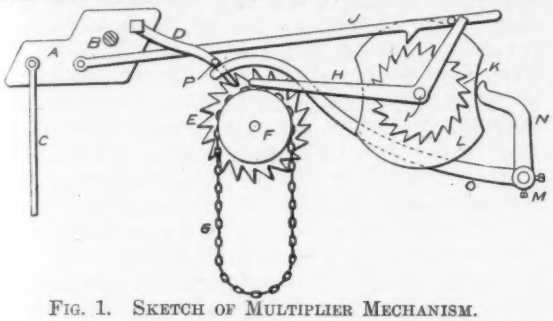


Fig. 1. Sketch of Multiplier Mechanism.

lowered and its other end raised, carrying the pawl J out of contact with the multiplier ratchet K. It will be noticed that the box chain revolves in one direction and the multiplier disc revolves in the other. The multiplier motion will remain in operation until a multiplier ball on the chain comes under the arm H.

Should it be desired to increase the value of the multiplier to 24 picks, this can be done by fixing a piece of tin over one of the concaved places, thus making one hollow place instead of two.

A double cam on the pick cam shaft imparts motion to the upper mechanism of the box motion. One cam works the oscillating lever which operates the pawls that turn the filling chain ratchet and multiplier, and the other cam gives motion to the disconnector or as it is sometimes called the "still box motion;" this motion is to prevent the driving rod from working when the filling breaks, and to prevent the boxes from changing. A sketch of the motion is shown by Fig. 2. A represents the large cam and B is the small cam. The small cam assists in drawing back of the motion after being disconnected by the filling breaking.

The cams work between two distinct elbow levers C and D. Both levers are supported on the same stud E and this stud is fixed to the bracket attached to the cross rail of the loom. An arm F is attached to the top arm of the bottom elbow lever D. The driving rod G, which imparts motion to the upper box mechanism is attached to the lower end of the bottom elbow lever D.

The top elbow lever C is operated by the large cam A. A spring clamp H is fixed to a projection of the top elbow lever C, and this clamp H grips a stud I, that is fixed to the upper portion of the lower elbow lever D. When the cams revolve, the large cam A comes into contact with the upper elbow lever C and raises both levers at the same time, owing to the action of the spring J, that is attached to the two levers. The arm F passes back and forth through a slotted bar K which is supported by a bracket fixed to the loom side.

When the filling breaks, the slotted bar K is raised and as the arm F is driven forward, it will come into contact with the bottom of the slotted bar K, and the result will be that the lower elbow D can not move any further. The stud I on the lever is then forced out of connection with the spring clamp H. This being out of connection, the connecting rod G will not be lifted high enough to allow the pawl to force over the ratchet on the filling chain barrel. The spring J is extended during the process, and the subsequent contraction of it draws back the top elbow lever C.

The Lower Box Motion.

The lower mechanism of the box motion is sometimes called the "pin gear motion," on account of the large segment gear or star wheel receiving its motion from the pin gear. A sketch of the mechanism is shown in Fig. 3 for a 6x1 box motion. The pin gear or dog A, is on the end of the pick cam shaft. The pin gear is cut away at one part in order to give intermittent motion to the star wheel B. For one revolution of the pin gear A, star wheel B is turned one tenth of a revolution. The perimeter of the star wheel contains ten segments of gear teeth. The pin gear A, which gives the intermittent motion to the star wheel, is secured to the end of the pick cam shaft. Located around the star wheel are small segment gears C, D, and E, which can revolve on their respective shafts. Spaces on opposite sides of the perimeter each of the gears contain no teeth, but are arranged to have a pair of plugs F slide in them, said plugs being located on a collar on the shafts with the gears C, D and E. Each pair of plugs is controlled by a rod which is operated by the box chain. In their normal position the gears C, D and E have one

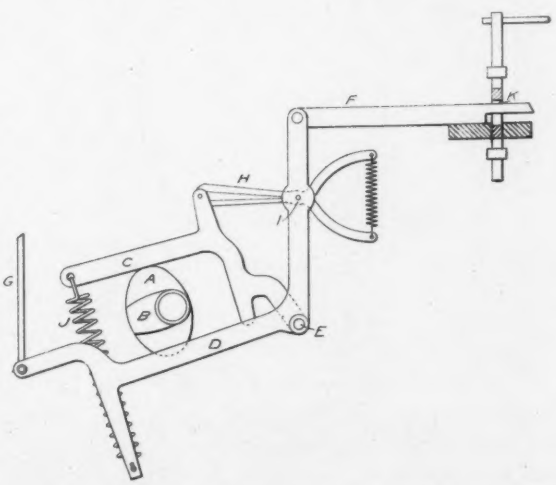


Fig. 2. Sketch of Disconnecting Mechanism.

of the spaces face the star wheel B, so that the revolution of said star wheel does not cause the segment teeth on its perimeter to engage the gears. This is the condition when the top or first box is on a line with the race plate of the loom. The object of the plugs is to provide means for having the gears C, D, and E, engage with the perimeter of the star wheel and receive one-half revolution, when a ball on the filling chain calls for a change of boxes.

The two plugs on one collar are of unequal length, one being twice the length of the other. The short plug

is the starter or raiser, and the long one is the returner. When the collar carrying the plugs is in its normal position, the shorter plug is always at the bottom or nearer to the star wheel, so that when the connecting rods is lifted, the small plug is pressed into the blank space on the small gear and performs the function of teeth. The longer plug will now be nearer to the star wheel.

There are three fingers resting on the top of the box chain, each one being connected to its respective rod, which controls a pair of plugs. Whenever a ball on the filling chain comes under a finger, the latter is raised, and through its connection throws its short plug into the space in the gear C. The star wheel B will then act upon the gear C and turn the latter one half of a revolution, that is, until the space on the opposite side of the gear faces the star wheel. Secured to the same shaft with the gear C is a circular plate G with an eccentric pin H which works in a slot I on a lever J centered at K. A similar plate with an eccentric pin is secured to the end of the other top gear D, the pin working in a slot on the other end of the lever J from the first slot mentioned. On the end of the

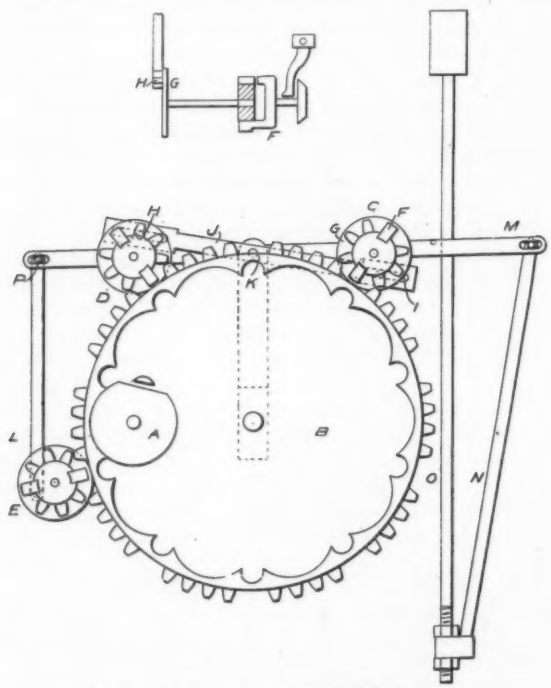


Fig. 3. Sketch of Lower Mechanism.

shaft of the bottom gear E is a similar plate with an eccentric pin to which is attached a vertical arm L, the top end of which is connected to an arm M, centered at K. The other end of the arm M is connected to a rod N, which holds the box rod O at the lower end.

When the top front gear C is actuated, the top back gear D acts as a fulcrum for the lever J. The center K is thus raised, and through the levers M and N, the box rod is raised, bringing the second box on a line with the race plate of the loom. When the top back gear D is actuated, the top front gear C acts as a fulcrum for the lever J. When the bottom gear E is actuated, the center K is the fulcrum for the lever M. When both the top front and back gears C and D are actuated simultaneously, the point P is the fulcrum. To bring the boxes back to their first position, the riser on the chain must be turned from under the finger, allowing the connecting arms to fall, thus drawing the plug outwardly until the larger plug fills the blank space and causes it to engage in the star wheel. The different boxes are actuated as follows: Consider first box in position; second box is brought into place by gear C; third box is gotten by gears C and D; fourth box is gotten by gear E; fifth box is gotten by gears D and E; sixth box is gotten by gears C, D and E.

Timing of the Box Motion.

When setting the double cam on the pick cam shaft that operates the head motion, have the small cam on the bottom center when the crank shaft is just behind the bottom center coming forward and have the shuttle in the single box end. In setting the pin gear which drives the star wheel, have the stud or pin on the bottom center when the crank shaft is on the back center, picking from the box side. Or when the shuttle is in opposite box with the crank shaft on back center, have the pin on the top center.

The timing will be different when this motion is added to another make of loom. In the Crompton loom, for which the above setting is given, the stud on which the star wheel revolves is on a line with the pick cam shaft, while on another make of loom, the stud is liable to be below the center, thus the timing will be different. The following is a very good setting to try for such a case when the stud is lower: Set the pin on the top center with the crank shaft on top center, and the shuttle at the box motion end.

On a four box motion there is only one box lever to the motion, and this lever has to supply both compound and single leverage. It can therefore readily be seen that the single cam has to be the fulcrum when the compound end is used, and the compound end will be the fulcrum for the single leverage. It is impossible to change the position of either of the studs at the end of the levers without changing the position of the boxes. Suppose the first box has been set level with the race plate, the second box is then raised and is found to be too low; should the stud be moved out to obtain the right amount of lift, it is possible that the lift will be too much when the third box is raised, and again when the boxes are dropped down to normal position, the first box is liable to be too low, and be below the race plate. One of the best ways to set this motion is to work between the two points of leverage obtained from both ends of the lever. Start first with the studs near their respective centers with the long stud inclined to the outside limit. Moving out of the vertical arm, will lower the boxes while in their normal position, but will raise the boxes higher when top gear is turned. The moving in of the long stud will give the same results as the moving out of the vertical arm. Moving the long stud out towards the end of the slot in the lever will raise the boxes, while in their normal position, but will not raise as high when raised by the gear.

Should the small segment gear become loose, care must be exercised when replacing the worn pin, for the motion can readily be made worse than it was with the loose gear by the springing of the small shaft, and causing the shaft to bind in the bearings. A worn projection of the fork plug will cause the boxes to skip, for instead of the projection engaging with the teeth of the spaced gear, the plug will spring out as soon as pressure is applied. The two fork plugs work in opposite directions

and when one side is worn, they can be changed and will be just as good as new ones.

Wrong timing of the chain barrel will prevent the fork plug from getting into place; bent chain bars, or broken risers will do the same. Chain links riding on the chain barrel will also cause skipping. If there is a lack of oil on the shaft on which the small segment gear is located, or on the stud of the small levers on the chain, or the bearings of the finger rod, the plugs will not return to their places when the boxes are lowered.

A small coil spring is sometimes placed around the bearing of the finger rod and in contact with the finger, and this will help to draw in the plug. Should the hook to which the spring of the check finger is attached, become loose, it will allow the small segment gear to turn a trifle too far around and will cause one of several things; boxes to move too high, or too low; the picker to become fast in the boxes, or the teeth of the small segment gear will not mesh with the teeth of the star wheel. Boxes binding in the slides will have a tendency to injure the motion on account of the increased pressure being put on the gears. If the star wheel shows a tendency to travel too far after the pin gear has left it, the probable cause will be that the supporting stud is worn.

Building the Filling Chain.

In building box chains for a four box motion, one of the principal things to be taken into consideration is that there should not be a skip of the boxes from the fourth to the first if it is at all possible to avoid it. This skipping will knock a box motion out of running order sooner than anything else, on account of the boxes having to make this change in as short a time as if the boxes were changing from the first to the second box. On some patterns it is impossible to avoid jumping from the first to fourth box. When such is the case, it is best to raise the boxes instead of having the drop from the fourth to the first. When using a filling that is much softer twisted than the other filling being used, it is advisable to put this filling in the top box whenever possible, so as to prevent the soft twisted filling from clinging to the other filling.

There are various methods of making out drafts for the box chains. Suppose that a fabric is to be made up of the following colors: 6 picks red, 4 picks black, 6 picks green, 12 picks white, 4 green, 2 black. Write the colors out as in the following table in the order they are inserted in the fabric.

Red	3	2	4	4	6	picks
Black	2	4	3	3	4	"
Green	4	3	1	2	6	"
White	1	1	2	1	12	"
Green	4	3	1	2	4	"
Black	2	4	3	3	2	"

Mark opposite each color the number of the box in which the color has to be tried in. The first three columns do not give a very satisfactory arrangement, as there is more or less skipping. The fourth column is the best arrangement, as there is no skipping of the boxes.

After figuring out the best arrangement for the operation of the boxes, the next thing is to write out the box plan for the filling chain. Each bar in the chain equals two picks. We would therefore have a chain built as in Fig. 4.

The right-hand column marked M is for the multiplier. The other two columns indicate how the gears have to be worked.

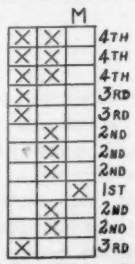


Fig. 4. Box Chain Pattern.

SELVAGES.

Relation of the Selvage to the Cloth. Plain Selvage, Tape Selvage.

(*Contributed exclusively to* Cotton.)

by A. T. A.

Practically every woven fabric has some kind of a selvage. It is generally characterized by containing double threads, or by the use of twisted threads for the selvage. The purpose and necessity for a selvage are twofold. It is

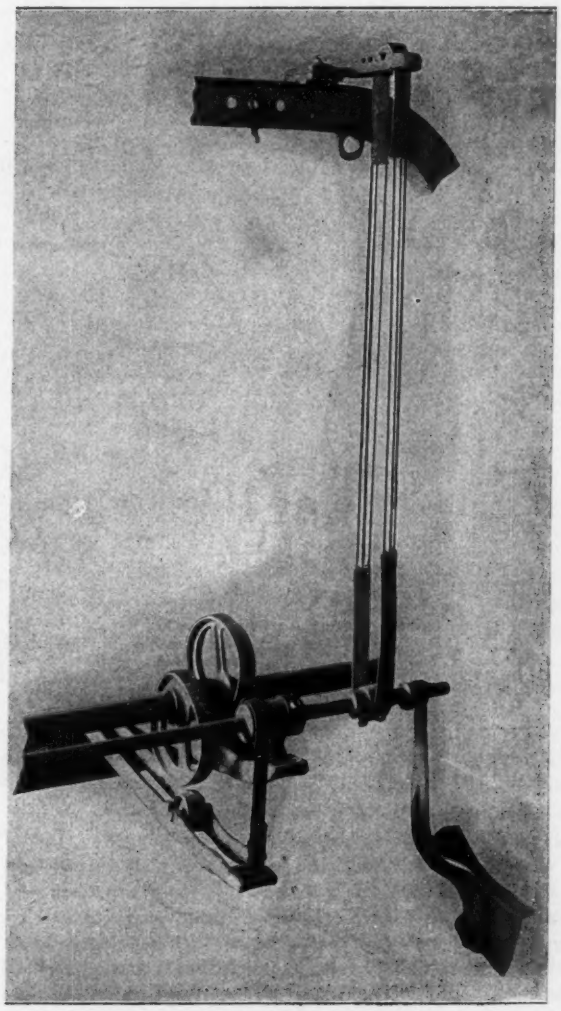


Fig. 1. Mason Plain Selvage Motion.

made stronger than the body of the cloth to withstand the additional strain during weaving to which the threads are subjected. This is due to the beating-up process. The width of the woven cloth at the fell is less than the width

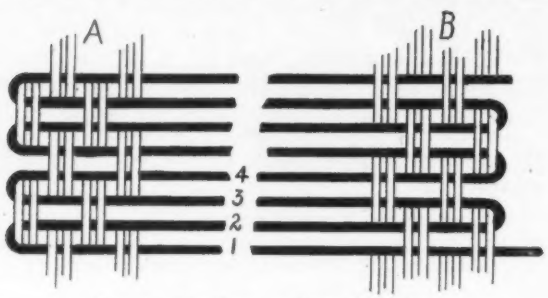


Fig. 2. Diagram of Tape Selvages.

in the reed, and when the lay beats a pick up to the fell, the outside threads composing the selvage are pressed outwardly and therefore more or less strained. The other purpose of a selvage is to provide clean edges for the fabric. A piece of goods may easily be depreciated in value by having a rough and knotty looking selvage, whereas a clean, straight selvage will give the cloth an advantage over its competitors, when other things are equal.

There are, generally speaking, only two types of selvages used in cotton goods, namely, the plain selvage and the tape selvage. It is true that some fabrics, such as three, four, and five leaf twills, are sometimes woven on cam looms without any special arrangement for selvage. This, however, can only be used for special classes of work, where the selvage is not of importance, because it gives a very ragged appearance to the edges and causes them to curl more or less. Woolen and worsted goods most frequently have twill selvages. It is commonly called "listing."

The plain selvage is mostly used for cotton goods, on account of the simplicity of its production. It is simply a plain weave made of double threads or twisted threads, and therefore for plain cloth, it is produced by drawing the ends in on the regular harnesses. For twill and sateen work with cam looms and for dobby work, special motions for producing the plain selvage are attached to the loom.

The accompanying illustration, Fig. 1, shows the main portion of the attachment. Similar straps are used at the other side of the loom for the selvage on that side. As shown, the regular two-harness cams are shifted from the center to one side and fastened to the pick cam shaft, as usual, for plain work. This shifting is necessary to make room for the twill cams which are to operate regular harnesses. The two-harness treadles are moved to one side to correspond to the cams, and work on top of the back girt.

Two small stands, near the bottom of the loom (one of which is shown), are bolted to the loom sides, and support a small iron shaft. On this shaft is a harness block, similar to that used on the top harness roll for plain weaving. Straps are fastened from this block to the two-harness treadles, and thus the small iron shaft is given a partial backward and forward rotation by the cams. On

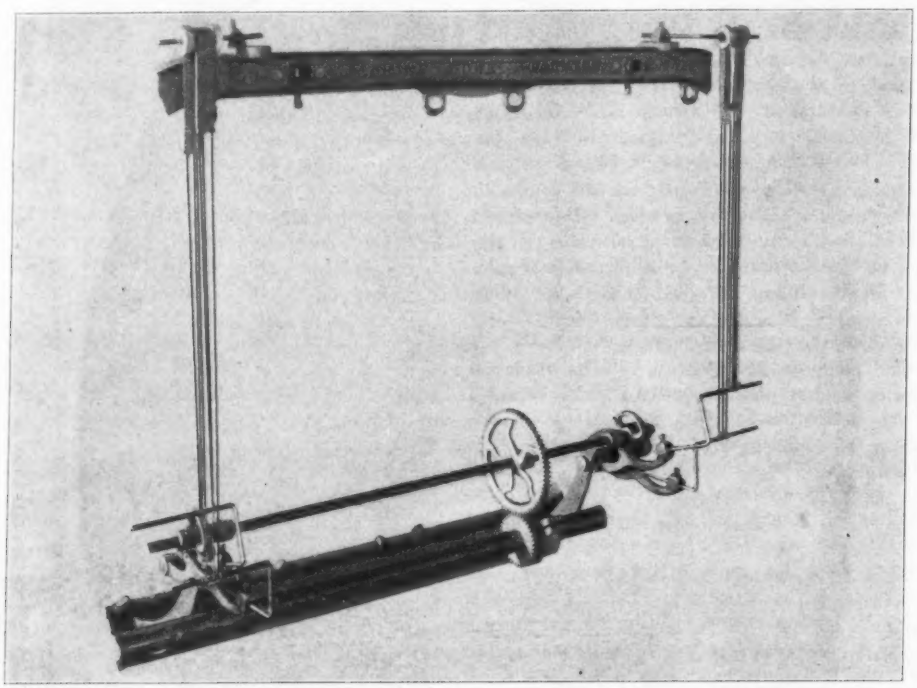


Fig. 3. Mason Tape Selvage Motion.

the ends of this small shaft are placed plain blocks, to which are connected the selvage heddles. On the loom arch are bolted two small stands made adjustable, so that the selvage heddles can be moved in or out to suit different conditions. Working in each of these stands is a plain roller, to which is fastened the upper strap of the selvage heddles. The plain selvage motion is very simple in operation, and can be easily and quickly applied to a loom.

In drawing in the threads for a plain selvage the outside thread of the left-hand selvage in the loom should be drawn in on the front harness, and the outside thread of the right-hand selvage should be on the second harness. This will give a smooth, straight selvage. The reason is that the filling in both instances will work on the outside threads when they are held tightest, that is, when they are in the bottom shade. If the outside threads of the left-hand selvage was on the second harness, the filling would work on it, when said thread was in the top shade, and as the thread is looser in this position than in the bottom shade, the selvage will be more or less loose and irregular.

TAPE SELVAGE MOTION.

The tape selvage differs from the plain selvage in appearance and in the manner of producing the same. The tape selvage is of a basket weave design, that is, there are two picks in one shed, and the woven selvage has the appearance of tape. It is more generally used for four, five, or six-harness weaves, and especially with filling effect sateens. It is more suitable to these weaves than the plain selvage is, owing to the fact that its take-up in weaving is less than the plain selvage, and more nearly corresponds to the take-up in the body of the cloth. One of the distinct features in the production of a tape selvage, is that each selvage has to be operated by a separate set of cams. The reason for this is best shown by means of the accompanying illustration, Fig. 2, which is a diagram of the tape selvages of a fabric, showing the relative interlacings of the threads.

In making this selvage, the fact must be kept in mind that the filling must interlace with an outside thread every time the shuttle is driven from that respective side of the loom. This is necessary, in order for the filling pick to be caught and held in place in the cloth. In other words there are two conditions to satisfy in making the selvage, namely, each shed must contain two picks, and the filling must interlace with the outside threads. These conditions are satisfied by using two up and two down four-harness cams, and setting each one to suit its respective selvage. Consider the case shown by the diagram. The shuttle is in the right-hand box and the loom is going to make the first pick. The cam operating the skeleton harness for selvage B will operate the threads just before the pick is made. After the first pick has been made, the cam for operating the skeleton harness for selvage A will operate the threads before the second pick is made. The filling thread will therefore interlace with the outside thread of selvage A on the second pick and thus be held. The cam for making selvage B does not operate the threads on the second pick, so that the shed remains the same as for the first pick. After the second pick, and before the third, the cam operates the threads of selvage B, so that on the third pick, the filling is caught at that end by the outside thread. While the cam for selvage B has operated its respective selvage threads, the cam for selvage A has allowed the shed of its selvage to remain open, so that two picks are thus put in each shed. The shed in selvage A operates while that of selvage B remains open, and vice versa, thus producing the desired result as explained. The tape selvage produces a very handsome selvage, and, in contrast with the twilled effect in the body of the cloth, is thrown up very boldly.

The illustration, Fig. 3, shows the rigging as applied to the loom. As it is often necessary to remove from or add this motion to the loom, the driving gear on the pick cam shaft is generally made in halves to facilitate its application or removal on the shaft. This gear drives another gear which contains twice as many teeth as its driver. In other words, the cam shaft for the selvage motion makes one revolution for every four picks. This larger gear is fastened to a small shaft which is supported by two small stands, bolted to the bottom girt at the back of the loom. These stands also support the small treadles which operate the selvage heddles. The two small cams which operate the selvage heddles, are placed on the respective ends of this small shaft. Bolted to the loom arch, are two small stands, carrying the wires which support the spools, over which the strap for the heddles passes.

COST OF WEAVING.

(*Contributed exclusively to* COTTON.)

BY C. G. F.

The majority of mills to-day are making a variety of styles of goods; some of them eight and ten styles. The question of weaving cost is rather a complicated one in such mills, especially where the styles of goods vary radically in weight or process of weaving. It is safe to say that there are few mills that know what each style of goods costs them. The cost of weaving is more easily ascertained than that of carding or spinning, that is, the records are more easily kept and the calculations are simpler.

The subject of weaving cost can best be discussed by taking a practical example. For illustration, we will consider a small mill of 300 Draper looms making three styles of goods as follows:

100 Looms on 64x60—7.25, 28-inch Print Cloth.
100 Looms on 60x56—4.00, 36-inch Sheeting.
100 Looms on 52x48—3.00, 36-inch Sheeting.

For the month ending Sept. 30, 1909, the cloth room balance showed a production as follows for 26 working days of 10 hours each:

100—64x60, looms produced 130,000 yards of cloth.
100—60x56, looms produced 117,000 yards of cloth.
100—52x48, looms produced 135,200 yards of cloth.

130,000 yards 64x60÷7.25=17,931 lbs.
117,000 yards 60x56÷4.00=29,250 lbs.
135,200 yards 52x48÷3.00=45,066 lbs.

Total 92,247 lbs.

Now the question is, what did the weaving of the print cloth cost per yard and per pound, and what did the sheetings cost per yard and per pound?

We will, of course, have to proportion the general expense first. To do that, it will be necessary to have an itemized account of the weave room pay roll for the month. Some mills claim that the general expense should be proportioned from the pounds produced of each style goods; other mills claim that it should be proportioned from the number of looms operated on each style of goods.

We will take the number of looms on each style as a basis, assuming that the overseer and second hand spend about the same amount of time on the 100 print looms, as they do on each of the 100 sheeting looms, and that the oiler can attend to 100 print looms in the same time that is required for 100 sheeting looms. We also assume that the smash hand, filling roller, sweepers, loom cleaners, etc., spend about the same amount of time on each 100 looms.

The itemized pay roll is as follows:

1 Overseer	@	$3.00	per day, 26 days	=$78.00
1 Second hand	@	1.75	per day, 26 days	= 45.50
1 Oiler	@	1.10	per day, 26 days	= 28.60
1 Smash hand	@	1.40	per day, 26 days	= 36.40
1 Filling Roller	@	1.25	per day, 26 days	= 32.50
2 Loom cleaners	@	1.25	per day, 26 days	= 65.00
1 Man to haul cloth and brush down	@	1.25	per day, 26 days	= 32.50
1 Spare man	@	1.25	per day, 26 days	= 32.50

Total general expense $351.00

The proportion for each 100 looms will be one-third of $351.00 or $117.00 per style of goods.

100 print looms—	one fixer	@	$1.75 day	=$45.50
80 sheeting looms—	one fixer	@	1.75 day	= 45.50
80 sheeting looms—	one fixer	@	1.75 day	= 45.50
One fixer on 20—4-yd. sheeting looms and 20—3-yd. sheeting looms		@	1.40 day	= 36.40

Total for fixing $172.90

We therefore have,

100 print looms—general expense and fixing=$162.50
100 60x56 looms—general expense and fixing=$180.70
100 52x48 looms—general expense and fixing=$180.70

We will next take up the cost of regular weavers. The spare weavers should not be considered at all, because when a regular weaver is out, the overseer should certainly deduct more than enough cloth from the regular weaver to pay the spare weaver.

Example: A 20 loom print cloth weaver is out for one day, then the overseer certainly should not have to pay over $1.40 or $1.50 for a spare hand to run the 20 looms; and each loom should turn off a cut per day of 50 yds. which at 8 cents per cut would be $1.60. The company is then 10 cents on the safe side in the matter of payment. This is a very important point in a weave room. The overseer should add up the spare hand cost each day and add up the number of cuts he has deducted from the absent weaver's account, to see how his cost is averaging. I once knew of a weave room overseer who paid the spare hands the same wage that the regular weavers made. As a consequence there were not over half of the looms given to regular weavers; everybody wanted to be a spare hand. The production went down; the cost went up; the overseer went out.

The cost of regular weavers for the month would be:

2600 cuts of print cloth	@	8 cents per cut	=$208.00
2340 cuts of 60x56	@	13 cents per cut	= 304.20
2704 cuts of 52x48	@	10 cents per cut	= 270.40

Total cost for regular weavers $782.60

Summary.

100 print cloth looms.

General expense $117.00
Fixing 45.50
Regular weavers 208.00
—$370.50

$370.50÷130,000 yds. produced=0.29 cents per yd.
$370.50÷ 17,931 lbs. produced=2.07 cents per lb.

100—4-yard sheeting looms.

General expense $117.00
Fixing 63.70
Regular weavers 304.20
—$484.90

$484.90÷117,000 yds. produced=0.41 cents per yd.
$484.90÷ 29,250 lbs. produced=1.65 cents per lb.

100—3-yard sheeting looms.

General expense $117.00
Fixing 63.70
Regular weavers 270.40
—$451.10

$451.10÷135,200 yds. produced=0.33 cents per yd.
$451.10÷ 45,066 lbs. produced=1.00 cents per lb.

Total weave room pay roll $1,306.50
$1,306.50÷382,200 total yds. produced=0.34 cts. per yd.
$1,306.50÷ 92,247 total lbs. produced=1.42 cts. per lb.

The cost of this weave room is of course too high, but it is not the only one; there are many others in the same fix. The point we wish to make in giving the cost of this weave room is to emphasize fully the fact that there are many mills selling goods on a basis of their average total cost which is very misleading. For example, if this mill should sell its print cloth, taking it for granted it was costing 0.34 cents per yard or 1.42 cents per pound (which is the average total cost), when really the goods are costing them 0.29 cents per yard or 2.07 cents per pound, any one can readily see how misleading this is where a mill has several styles of goods that vary radically in weight or numbers of yarns. I recently had charge of a large weave room on 28-inch prints, and the cost averaged about 1.40 cents per pound; we did run as low as 1.25 cents per pound for a few months.

There is no doubt in my mind that there are many mills making a style of goods on probably just a few looms, and are actually losing money, but as no one knows exactly what the goods cost, and the selling agents or the manager insists on the superintendent making that style, he takes it for granted that he knows about what it costs to weave it, because his weaving cost has never been over 1.5 cents per pound. The above mentioned mill had better take the 100 looms off of prints as quickly as possible and put them on something they can make cheaper.

The bleaching power of a bleaching liquor, and the rate at which it is spent, are factors which run parallel the one with the other.

Many old dyehouses show an impossibility to remove the fog economically from the rooms, owing to the structural form of the buildings.

It is generally admitted that chrome salts (that is, bichromates) are the most searching of mordants, and exercise a powerful oxidizing effect upon both colors and fibers.

As any blower in a mill heating system can easily give more efficient results when placed near the air supply it would seem preferable to install it at the inlet and handle the air before it is heated.

Any color or shade on wool can be dyed in the single-bath process, but, unfortunately, these can not be got fast; while those colors which are permanent require longer boiling together with either a preliminary mordant bath or a fastening bath subsequent to the dyeing.

CROMPTON & KNOWLES PRINT CLOTH LOOM.

The economical weaving of print cloths and other plain cottons requires a loom built for high speed, embodying a very simple construction in a strong and rigid frame. The loom is designed especially for this class of work. Its substantial frame and careful elimination of every unnecessary part insures a light running machine of the highest practicable speed. In its simplest form, this loom has a two cam and treadle harness motion. This number may be increased to three, four, or five harness for more fancy weaving. The frame is so proportioned that double arches and dobbies of various harness capacities may be applied.

CROMPTON & KNOWLES MEDIUM DUCK LOOM.

Several types of duck looms are built by the Crompton & Knowles Loom Works, for weaving different grades from light dress duck to the heaviest canvas dryer or papermakers felts. The accompanying illustration, Fig. 1, shows a medium duck loom that is heavier than the Intermediate loom, and is built more substantially with regard to the working parts. This type of loom is also a distinct departure in the matter of design and construction from the lighter duck looms. It is designed for weaving a considerably heavier grade of duck, which is suitable for certain kinds of belting, heavy tent cloth and similar goods.

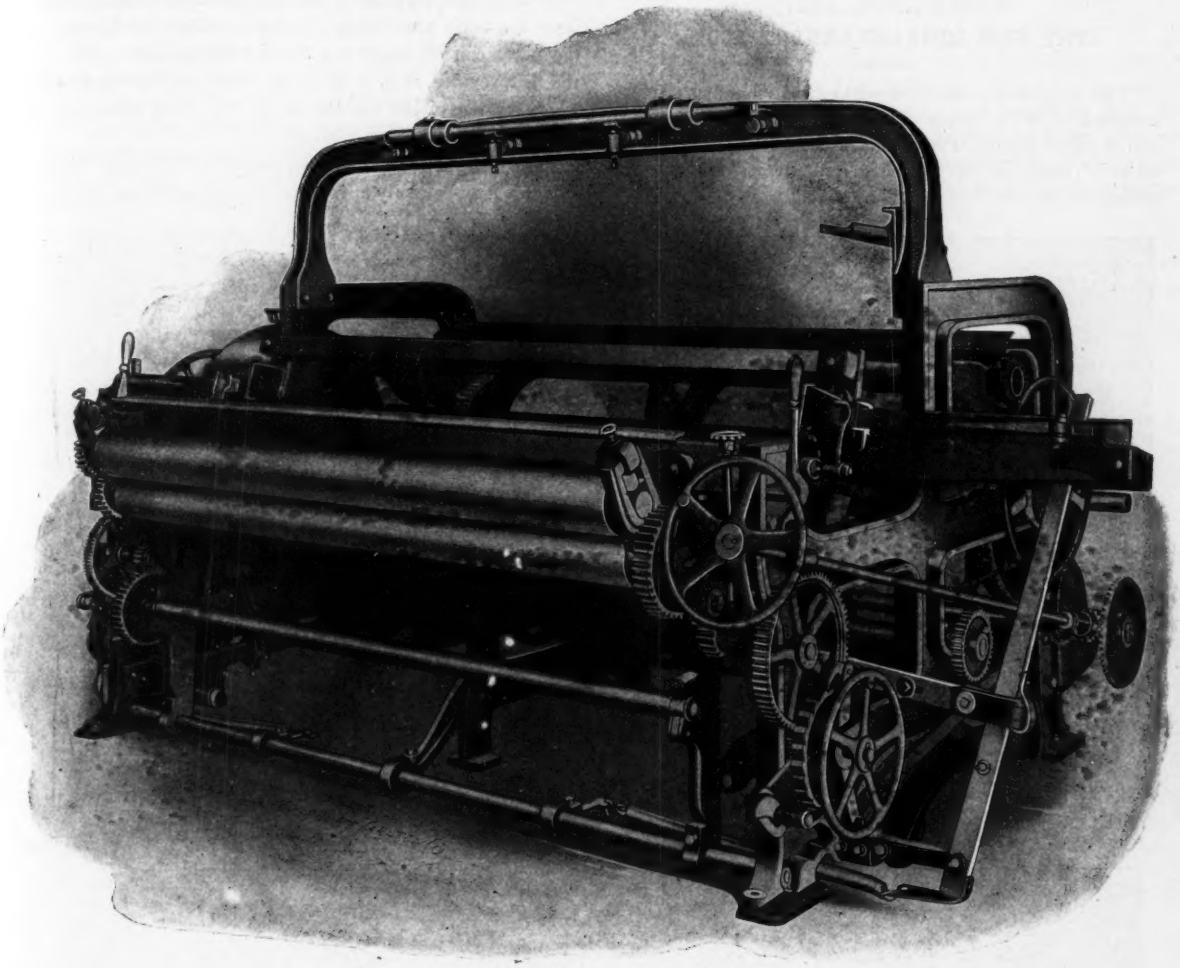


Fig. 1. Crompton & Knowles Medium Duck Loom.

The loom is usually built for single shuttle work, but is easily supplied with the drop box mechanism in any of the usual combinations. Different types of warp let-off are available; the ratchet friction, compound friction, Morton, or Bartlett. The take-up is positive with a lower cloth roll and affords a very convenient method for taking the cloth from the loom. The loom is driven by tight and loose pulleys on the crank shaft. There is a side shipper with brake, and a side-filling stop motion.

The frame includes three iron top girts for warp tension. The driving mechanism consists of a heavy type of friction clutch pulley on the crank shaft. The pulley has a very wide surface to suit the width of belt required for driving the loom. The harness motion is operated from the bottom shaft by cams and treadles. A single arch supports the harness roll shaft.

On the heaviest type of duck loom which has a massive girt for the arch, the harness are operated by a special

hammered steel crank shaft with a rack and pinion drive to the upper and lower harness rollers. These rollers carry chain connections to the harness frames, thus making a positive and powerful combination for the movement of the harness.

Referring again to the medium loom, extra sets of cams are applied to wide looms. The friction heads for the geared let-off motion are on the shaft under the beam. The friction is adjusted from the front of the loom by means of an upright pressure rod and hand wheel, shown at the right-hand side of the loom. Thus, friction on the beam may be released and the direction of its rotation reversed from the front of the loom. The take-up is positive and has fluted iron take-up rolls and iron cloth roll.

THE NEW LOMBARD-LANDRY LOOM.

This loom is the invention of Louis H. Landry. It was designed by W. S. Southwick for the production of woolen and worsted goods. Patents have been allowed on all the essential parts of the machine, and the makers are preparing to put the looms on the market at once.

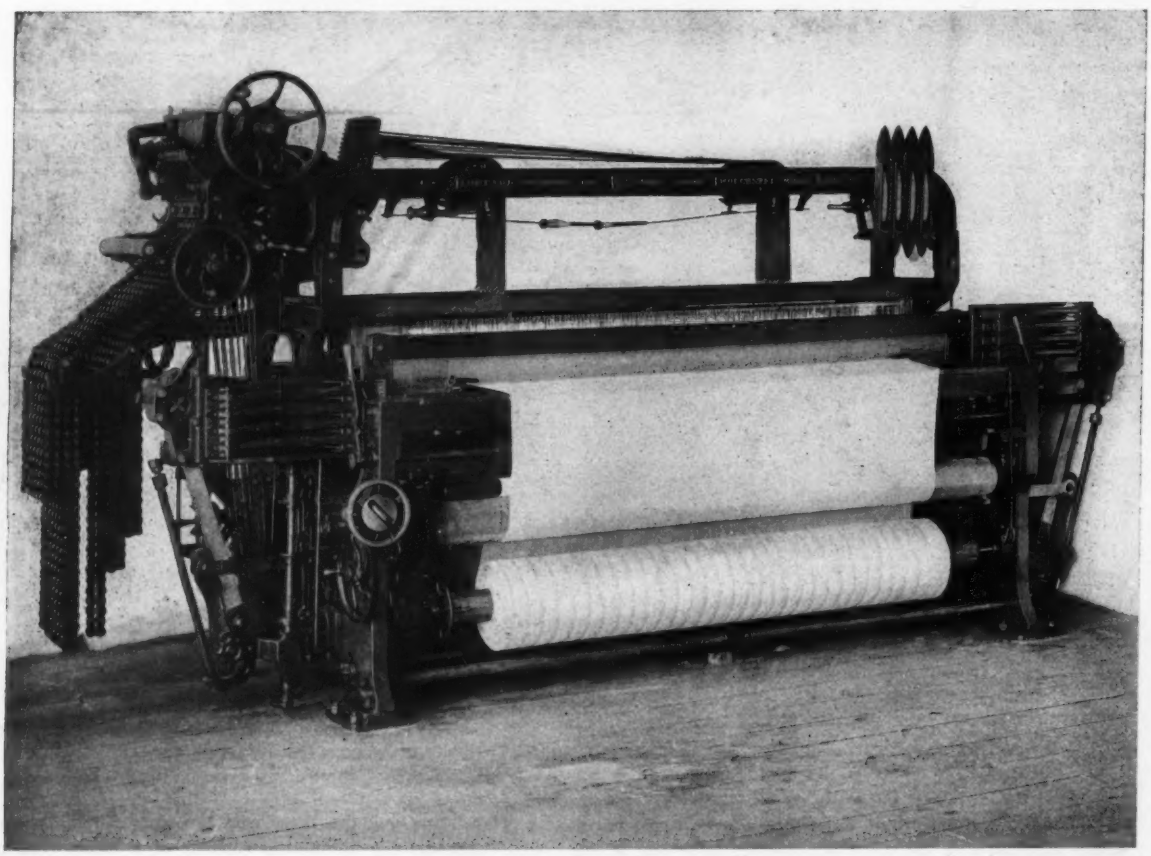
In brief, it can be said that the Lombard-Landry loom has been designed to run at a 15 to 20 per cent. higher speed than the usual rate of looms of that class. This means a more substantial construction of the parts, wherever an increase of vibration or strain might be produced. The builders feel that the loom's capacity for increased production is the most important consideration from the worsted and woolen manufacturers' point of view, but at the same time the simplicity of the working parts, and their easy access, will be greatly appreciated by the loom fixers, and tend to reduce materially the cost of repair parts to the manufacturer.

A front of the loom is shown in the accompanying illustration. The loom is of the closed shed type, and is operated by a new harness motion. The harness are opened by means of a pair of oscillating blades which receive their motion from the head shaft, the upper blade raising the harness, and the lower one dropping them. The harness are evened up by a rocker arrangement, which is governed by an eccentric on the above-mentioned shaft.

The box motion receives its power through eccentric gears from the main head shaft. It has a positive lock, and all the parts can be easily reached for adjustment. The box rod is provided with a releaser which acts automatically whenever the picker catches in the box, thus relieving the box-motion parts of extra strain.

The pick motion is arranged outside of the loom frames, where it may be easily adjusted. Each picker stick is driven by a pick ball which is attached to the crank shaft. When the pick ball strikes the bat wing, it is directly under the crank shaft box, thus securing a firm pick. The usual camshaft is not used in this loom, thus allowing room for a warp of about 50 per cent. larger size.

A new automatic let-off motion for the warp is provided.



The Lombard-Landry Loom.

A special spring is used, the tension of which is controlled by a feeler which follows the warp.

The main driving clutch is of the friction type, having two metal faces to produce the bite. The advantage over leather-faced clutches is that a quicker release is obtained; the clutch is not affected by oil. The main driving gear is so arranged that it may be easily removed or reset in any one of three annular positions.

The take-up motion is provided with a pocket for the handle, designed to make the practice of pumping impossible. A simple provision is also made for letting back a large amount on the cloth roll quickly and with ease.

The lay is connected to the crank shaft by a strongly constructed and easily adjustable arm. The hand wheel on the dobby is provided with means for readily obtaining a reduced speed when desired, thus requiring less effort in shifting the harness for picking out.

It may be said in passing, that in the introduction of the Lombard-Landry loom there will be no disorganization of the present weave room. Although the warp beam for the new loom has a flange large enough for 50 per cent. more yardage than the ordinary beam, yet the harness and reeds of other makers may be used on the Lombard-Landry without any alteration.

The mechanism of the loom is made accessible by placing most of the working parts, which are well protected by guards, outside of the frame.

The low depreciation account in this type of loom is owing to the absence of vibrating gears, and to the perfect adjustment of all the wearing parts.

The loom is intended to weave both woolen and worsted cloths, but its principal features apply to all fancy looms.

The Lombard Machine Company, which has begun the manufacture of these looms, is one of the oldest manufacturing enterprises in Worcester, Mass., dating back to 1823.

KILBURN, LINCOLN LOOMS.

Kilburn, Lincoln & Co., of Fall River, Mass., are makers of looms for weaving all the forms of cotton fabrics. This concern has been manufacturing weaving machinery for the past sixty years and their looms embody the experience of over half a century. During all these years, they have developed a loom which in general construction, perfection and detail, high quality of workmanship is considered by them one of the best on the market. These looms are equally well adapted for coarse and fine weaving. The speed and accuracy in weaving print cloth numbers are some of its chief characteristics, while, at the same time, the loom is so constructed that suitable motions for fancy weaving may be easily applied, and the same loom adapted to weaving the very finest goods.

STANDARD PATTERN LOOM.

This loom is especially adapted for weaving print cloth, and is the same pattern upon which the famous run was made by the Seaconnett Mill in Fall River, where 928 of these looms were in operation for a number of years, running 204 picks a minute and turning out a daily average of 51.3 yards per loom.

HEAVY PATTERN LOOM.

This loom is recommended for weaving the heavier grades of goods, such as heavy tickings and ducks, as well as wide goods of a lighter type. This loom includes all the light running and high speed qualities of the standard pattern and may be run on all grades of goods from the lightest muslins to the heavy ducks.

TWENTIETH CENTURY MODEL LOOM.

This loom is made especially for weaving fancy goods. It is of heavy construction, and like the heavy pattern loom, retains all the light running features which have for so many years recommended the looms of this company to manufacturers. Every device used in fancy weaving may be added to this loom when required for dobby or jacquard work.

In addition to the above, Kilburn, Lincoln and Co. manufacture box looms, narrow fabric looms, damask looms, and looms for all forms of cotton weaving and an improved dobby.

THE LOWELL LOOM.

The building of looms was begun in Lowell nearly a century ago and the Lowell Machine Shop for the larger part of this period has been closely identified with the development of the power loom, having come into existence as a machine shop in 1824. The character of its present product maintains its same high class in design, construction and general details.

It would not be practical within the limits of an article intended for one issue to review the entire field of loom manufacture, nor to describe even the details of so large

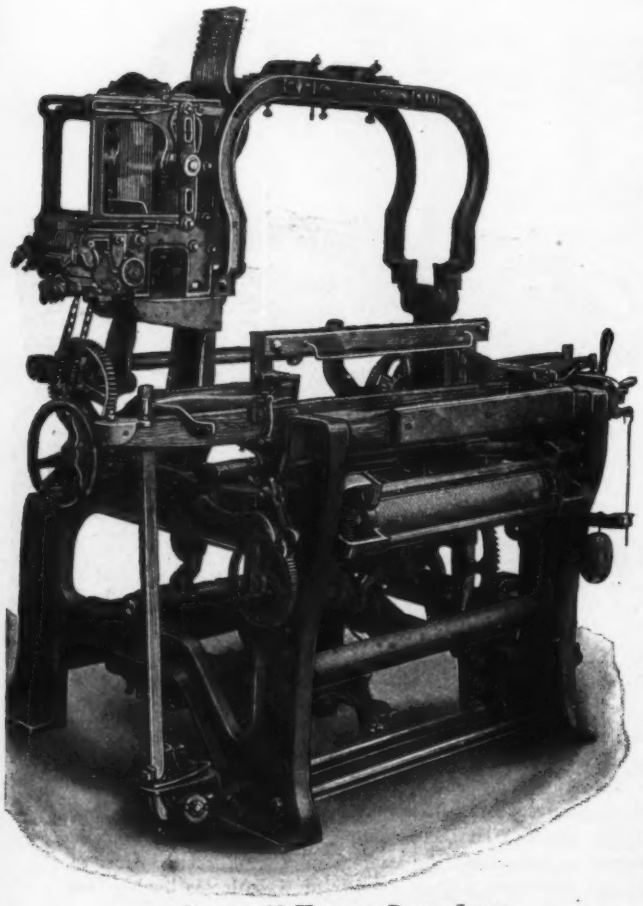
Lowell Light Duck Loom.

a line of looms, with their numerous modifications, as are made by this concern. It can be said generally that this concern is prepared to furnish looms for almost any kind of fabric. The Lowell Loom is also well known in the textile manufacturing centers of China, South America, and elsewhere, a large number of these looms having been exported.

PLAIN LOOM.

The Lowell plain loom is built in several different weights adapted to different fabrics from the lightest lawns to the lighter weights of duck. Each range of fabrics requires the use of different patterns, construction, and modification. After passing the light weights of single filling duck, heavy drills and sheetings, this line of looms formerly went into constructions adapted to the lighter weights of ducks having both twisted warp and filling, such as hose duck.

In recent years an intermediate weight of loom has been most successfully introduced and is particularly adapted to all weights of single filling duck, twisted filling duck and the lighter weights of regular duck. The particular advantage of this weight of loom lies not only in the ease in which it will handle this range of fabrics, but in the fact that it can be operated at speeds almost equal to those possible with lighter weights of looms, thereby avoiding impairment of production through a reduced speed, which is necessary with the heavier weights of duck looms. This intermediate weight of looms successfully merges the line into the more exacting requirements demanded for looms on such goods as hose ducks and fabrics of similar construction and weights. In covering the entire field effectively this concern builds a complete line of the heaviest type of duck looms adapted to weaving the heavier weights of army, sail, belting, and such other ducks required by the mechanical, agricultural implement, paper and rubber trade.



Lowell 12 Harness Dobby Loom.

A modification of this loom is adapted to camel's hair and other press cloths.

Branching from the plain loom for the lighter weights of fabrics, this concern builds a very complete line of fancy looms in which the popular features of the plain looms are retained. Simplicity, rigidity and avoidance of small parts easily broken, has characterized this loom and made for it a name for low cost in repairs.

On its dobby looms, any of the leading makes of dobby heads are furnished and effectively applied with all such attachments as double beam stands, inside adjustable beam heads, etc., usually contained in a complete equipment of a loom of this type. This loom is very extensively used in weaving diaper, momie, cotton worsteds, and similar fabrics.

To this same type of loom is applied drop box attachments consisting of an improvement in a pattern which has long been regarded as one of the most successful on the market.

Terry motions, selvage motions, and all forms of special motions and features are furnished and applied to these looms. Jacquard heads of leading makes are furnished and designed to rest upon supports on the loom proper or on special gantry timbers.

Recent modifications in plain looms have been made to meet the demand for looms with large shuttles to take long bobbins spun direct on frames or rewound. In many cases warp stop motions are also furnished.

Recent orders have called for the direct application of individual electric motors to these looms and these have been successfully applied and tested for over a year with satisfactory results. The demand of converters for extra long cuts has been met by increased sizes of cloth rolls which have been supplemented by larger diameters of loom beam heads. Numerous modifications of this line of looms are regularly made to meet the requirements of the silk, netting, and other special trades and in many instances the individual ideas of the manufacturers have been incorporated in the design of looms in the effort to meet the requirements of the trade in all its phases.

MASON PRINT CLOTH LOOM.

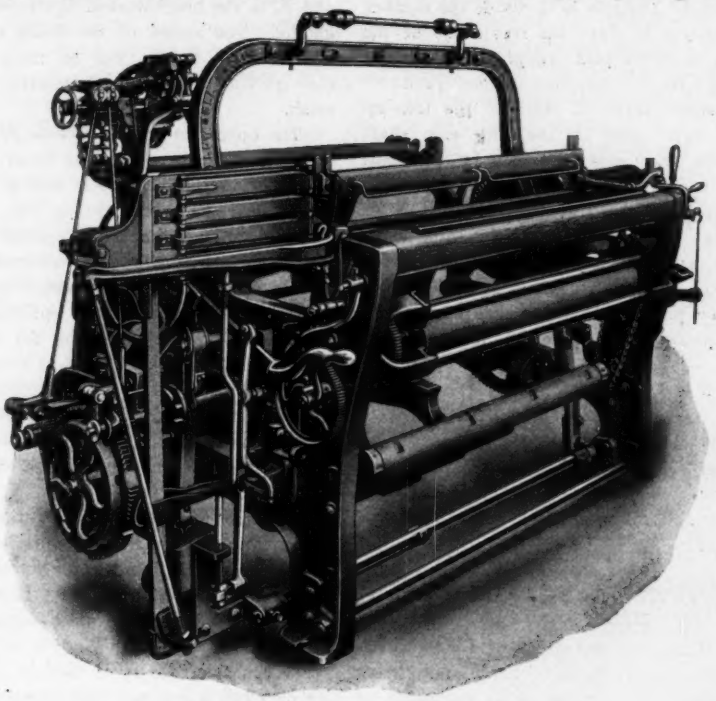
This loom is designed to weave print cloths and other light weight or medium fabrics and is specially adapted to the highest speeds, with a small consumption of power, and low cost of maintenance and repairs. For a given width of cloth, it occupies the smallest possible space, and has adaptability to a large variety of goods, at a moderate cost of time and money in making changes. It is adapted to receive either three, four, or five harness motions, and either tape or plain selvage motions. The looms are built in different sizes from 24-inch to 60-inch, and will weave light fabrics four inches wider than the name implies.

A roll of cloth 19 inches in diameter can be wound with the Mason cloth roll stands. The take-up mechanisms furnished provide for ease in handling the warp and changing picks. An improved let-back pawl, or the old shell dog, whichever is desired, allows of letting back one or more picks when the filling fails. The loom can be fitted with either a bunter brake, an adjustable filling brake, or a Mason patent compound brake.

The picking cam shaft and lay rocker shaft are of

cold-rolled steel, the latter working in detachable and adjustable bearings, thus avoiding the wearing of the loom frame itself. The crank shafts are of improved manufacture. All the bearings are of the most approved forms, with bolted caps. It has patent pick shaft, ball and cover; a sure and simple precaution against throwing oil.

The let-offs furnished are selective, the most suitable being used with the required class of goods to be made. The mechanisms can thus meet the wishes of all weavers. If the looms are not intended to receive the Northrop devices at a later date the shuttle binders can be arranged either at the back or front, as may be desired. Looms built with a view to receiving the Northrop devices will have the binder invariably at the back, which is necessary for obvious reasons. Shuttle binders can be of wood, cast iron, wrought steel, or wood faced with leather or steel.



Lowell 4 × 1 Box Gingham Loom.

The change gear in the take-up motion can be arranged so that one tooth in the pick change gear represents two picks in the cloth, or so that one tooth in the ratchet gear represents one pick in the cloth as may be preferred. In the latter case, the ratchet wheel is the change gear. The motion takes up cloth at every pick, by a pawl operating the ratchet wheel, either from the lay rocker shaft, or from an eccentric on the crank shaft.

The gearing for the motion, when one tooth in the change gear, represents two picks in the cloth is as follows: The ratchet wheel contains 100 teeth and is on the same stud with a 17-tooth gear which drives the change gear. The latter is on the same stud with a 16-tooth gear, which drives a 68-tooth gear on the end of the sand roller, the latter being 12.50 inches in circumference.

The constant is found as follows:

$$\frac{68 \times 100}{16 \times 17 \times 12.50 \times 1} = 2 \text{ Constant.}$$

To find the number of teeth required to produce a certain number of picks, divide the picks required by the constant, and the quotient will be the number of teeth in the change gear.

NEW STANDARD MASON LOOM.

This loom is specially designed to weave the higher grades of cloth, with the least possible imperfections, and without much increase of the cost of weaving over that of lower grades. These looms are made in different widths to weave varying widths of fabrics from 30 inches to 62 inches. The name of a loom usually designates the width of cloth that it is best suited to weave. For example, a 30-inch loom indicates that this loom is best suited for weaving goods 30 inches wide. The different dimensions for a 30-inch loom would be: Length of lay, 75½ inches; harness space, 36 inches; reed space, 36 inches; maximum space between beam-heads, 34 inches. The total distance between the outside of the take-up motion, and outside of the beam-head is 44 inches. It is adapted to all grades of plain cloth, from the lightest to the heaviest sheeting, and is adapted to receive the Northrop Filling Change and Warp Stop Motion, also twill motions, drop box motions, and dobbies. The loom has extra heavy frames; increased harness space, permitting the use of dobbies with a large number of harness; the Mason patent positive take-up motion, for the prevention of thin places; a breast beam take-up roll which permits the winding of a large roll of cloth, free from wrinkles and variation in width of cloth; and also an improved patent auxiliary yielding whip bar which materially lessens the breakage of warp threads, thereby increasing the quantity, and improving the quality of the production. Any of the let-offs in use which may be best adapted to the cloth to be woven, may be used on this loom.

All of the gearing for the take-up motion is located on

the right-hand end of the loom, and is placed so as to afford no interference for the operative in weaving. The belt shipper lever is also placed at the right-hand end, thus leaving the other end of the loom practically free from any special mechanism.

The proper change gear to use on the patent positive take-up motion, to give a desired number of picks per inch, is very easily found. The rule is to divide the number of picks per inch required by two; the result will be the required number of teeth in the pick change gear.

This rule is derived from a constant number found in connection with the entire train of gears in the take-up motion. A 20-tooth bevel gear on the pick cam shaft drives another 20-tooth bevel gear, which is on the same shaft with a single worm; this latter drives a 50-tooth gear on the same shaft with a 16-tooth gear; this latter gear drives the change gear which is on the same shaft with a 12-tooth gear, and this in turn drives a 48-tooth gear on the end of the sand roller, which is 12.50 inches in circumference. The pick cam shaft makes one revolution for every two picks. We, therefore, find the constant as follows:

$$\frac{48 \times 50 \times 20 \times 2}{12 \times 16 \times 1 \times 20 \times 12.50} = 2 \text{ Constant.}$$

To find the number of teeth of the required pick gear, when the picks per inch are given: Divide the picks per inch by the constant, and the quotient is the number of teeth for the pick gear.

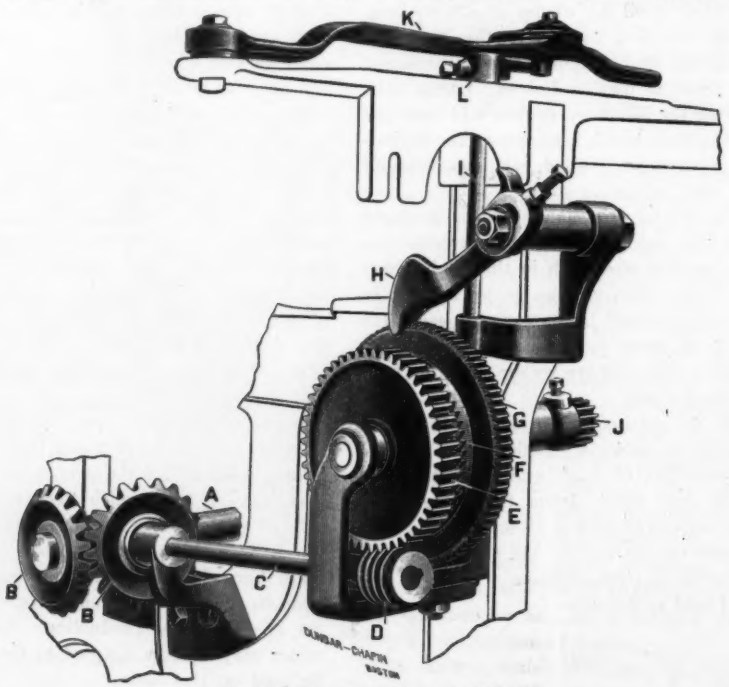
MASON PATENT POSITIVE TAKE-UP MOTION.

The construction of this take-up motion and its application to the loom are shown by means of the accompanying illustration. In the figure, A is the pick cam shaft of the loom; B and B are bevel driving gears, one of which is secured to the pick cam shaft; C is the side shaft on which are secured the bevel gear B at one end and the single worm D at the other; E is the worm gear, molded with one-half of the clutch F; G is the pawl ratchet gear, which is molded with the other half of the clutch F; H is the adjustable let-back pawl; I is the upright shaft, operated by the shipper handle and filling fork, through the top lever L; J is the gear leading to the regular train of pick gearing, and K is the lever worked by the filling fork and shipper handle. The action of the filling on the lever causes the clutch to be thrown out of mesh. The shipper handle through the levers, when operated, throws the clutch into mesh.

The operation of this motion is as follows: The single worm D is positively driven from the pick cam shaft by means of the bevel gears B and B. This worm drives the worm gear E, which drives the regular train of pick gearing through the gear J, when the clutch is in mesh. When the loom is stopped automatically, because of the failure of the filling, the clutch F is thrown out of gear by means of the levers and the upright shaft I; but, when the loom is stopped by hand by the operative, the clutch F is not necessarily thrown out of mesh. However, the clutch may be thrown out of mesh by this action in stopping the loom which then allows the pick gearing and the sand roll to be turned forward or back if necessary.

When, however, the shipper handle is in position for the belt to be on the tight pulley, the clutch is always in mesh, and "winding down" of the cloth roll, with consequent thin places in the cloth, is positively prevented. Arrangement is provided for letting the cloth back a few picks, in order to prevent any thin places when the filling runs out, by means of the pawl gear G and adjustable let-back pawl H.

When this take-up is used in connection with a dobby, or on cloth which will require an intermittent stoppage of the take-up mechanism, in order to produce heavy stripes, or checks, with the filling, a special device is furnished. In



Mason Positive Take-up Motion.

this special device a pair of small, finely-toothed clutches are thrown out of operation, thus arresting the motion of the side shaft, and, through its connections, the take-up roll and the cloth, as long as may be necessary to produce the desired width of stripe. The clutch is then thrown in mesh again. This clutch is operated from one of the ordinary harness levers on the dobby by means of a wire or strap connected to a small bell crank placed on the side of the loom, which throws the clutch in and out, according to the pattern chain. The whole device is very simple and not easily disarranged or likely to get out of order.

THE NORTHROP LOOM.

(*Contributed exclusively to* COTTON.)

The Northrop loom, built by the Draper Co., Hopedale, Mass., occupies a very unique position in the textile industry, as being the first commercial loom to supply filling automatically to the shuttle, and to incorporate a practical warp-stop motion for general weaving application. The introduction of this loom has practically revolutionized the weaving industry as applied to plain weaving, and has simplified the duties of a weaver to such an extent that as many as thirty looms can now be cared for by a single weaver. The fundamental principle of detecting the absence of filling by a filling fork causes a forward motion of the lay to rock a transferrer, or pusher, thus forcing the lowermost bobbin from the hopper into the shuttle, where it is retained by springs which grip the rings on the base of the bobbin, simultaneously displacing the empty bobbin. The end of the thread on the bobbin is previously attached to the hopper, and when the shuttle is picked, this thread is automatically led into the self-threading eye of the shuttle.

Fig. 1 shows an E model rigged up for five-harness work with the Lacey top rig, worm take-up, feeler motion, and double fork.

The hopper may be said to be the heart of the filling changer, and has undergone many changes since its first introduction. The latest style of hopper is shown in Fig. 2. This type of hopper will hold 25 bobbins, and is known as the spring-butt style. The bobbins are held in the hopper by having the bobbin bases contact with coiled spring-actuated pressing devices, on the theory that bobbins so held may be inserted with greater ease and held with greater security. The threading of the filling around the circle or disc is easier, in that the thread leads naturally over the smooth bobbin-tip disc, instead of having to be placed accurately at this point.

Another improvement in this device consists in the mechanism governing the bobbin on its way to the shuttle. The old rocking guide which often gave trouble through catching and breaking has been superseded by a combined guide and support. With this new hopper an entirely new design of rotating mechanism is used, arranged so that wear will not cause back lash. The stud on which the threads are wound is removable by hand for cleaning, the former bolt being cast solid in the end of a hand wrench, needing no extra wrench for operation.

ADJUSTMENT OF THE BATTERY.

In a loom without a filling-feeler, the various steps in the adjustment of the battery would be as follows: First, see that the filling-fork is set properly relative to the grate or grid. Then place the end of the filling-motion-finger against the filling-fork-slide and tighten the finger on the starting-rod by means of the set-screw provided.

Next, turn the loom, allowing the fork to engage the filling-motion-hook, until the latter has moved as far forward as it will. This will turn the starting rod into operative position, and the shuttle will now be on the battery side of the loom, in position to receive a fresh bobbin.

Now raise the feeler-finger, which extends from the starting-rod beneath the breast-beam, until the shuttle-feeler can swing forward against a stop provided for it, and tighten it on the starting-rod in this position. Be sure and set the feeler-finger high enough so that the pull of the starting-rod spring will not prevent the shuttle-feeler from bearing against its stop.

The latch-depressor, which is attached to the shuttle-feeler, should now be set so that the latch on the hopper will be struck by the bunter on the front of the lay. Bring the lay forward to the front center, thus causing the bunter to strike the latch and drive the bobbin into the shuttle.

The shuttle should be in the center of the shuttle-box, and when the tip of the shuttle is against the picker the shuttle-spring should be in line with the heads of the bobbins in the hopper. It is usually necessary to wrap a narrow piece of leather around the end of the lay to prevent the shuttle from going too far into the box, and on badly worn pickers it is customary to place additional pieces of leather inside this loop as required. If, now, the shuttle is in proper position, the transferrer which inserts the bobbin should not touch the shuttle anywhere, and should be approximately in the center of the shuttle. If this is not true the proper position may be secured by turning the eccentric pins, in the lay-swords, upon which the crank-arms work. In doing this be careful to turn the pins in both swords an equal amount, so that the length of the crank-arms shall remain equal. If either crank-arm has become too short, from wear, to allow this adjustment, it should be replaced by a new one.

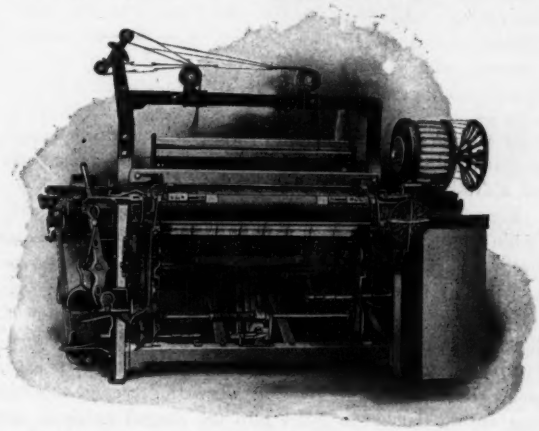


Fig. 1. Northrop E Model Loom.

If the head of the transferrer comes in the center of the shuttle, but the transferrer-fork does not, the latter may be bent into place, but before doing this it is always advisable to make sure that all adjustments have been properly made. The head of the transferrer should not quite touch the head of the bobbin when the former is at its lowest point, a clearance of not over 1-16 inch being desirable. This adjustment is obtained by means of the set-screw and clamping-bolt on the latch.

The shuttle-feeler will extend across the mouth of the shuttle-box, when the lay is in forward position and a bobbin is being transferred, and its end should come close to the back box-plate, but without touching it. If the shuttle is not in the box far enough to allow the shuttle-feeler to clear it, as the lay moves forward, the shuttle-

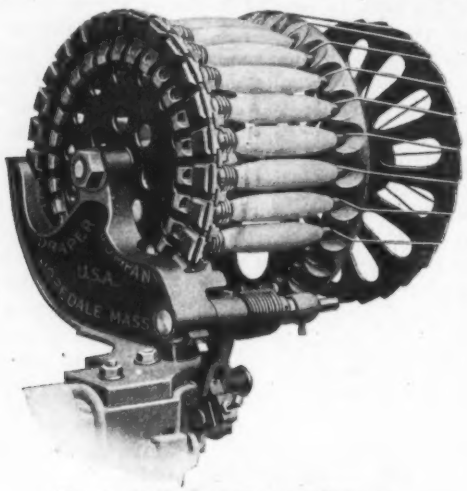


Fig. 2. Northrop Filling Hopper.

feeler will be pushed back, and through the latch-depressor, the latch will be prevented from engaging with the bunter and a fresh bobbin will not be inserted in the shuttle.

Thus, the shuttle-feeler prevents the transfer of the bobbin from the hopper to the shuttle when the latter is not in the proper position to receive it, and it should always be kept properly adjusted. In the setting of this part a leeway of one notch in the shuttle-spring is allowed. That is, the bobbin transfer will take place when the shuttle-tip just clears the shuttle-feeler and does not push it back. The latter is so set that when this occurs, the first ring on the bobbin will go into the second notch in the shuttle-spring. If, however, the transfer is permitted by the shuttle-feeler, and the first bobbin ring goes into the third notch in the spring, it shows that the shuttle-feeler is not close enough to the hopper, and the stand which carries it will probably require filing to overcome the trouble.

The setting of the parts pertaining to the battery is slightly modified on feeler looms by the presence of the filling-feeler and the feeler-thread-cutter, but many of the adjustments are not affected.

The movement of the starting-rod, on feeler looms, is transmitted from the the filling-cam follower through the feeler-slide and starting-rod-arm, instead of the filling-fork-slide and filling motion finger. The filling-motion trip, on the upper end of the cam-follower, should be set so that the notch in it will be in line with the end of the feeler-slide when the latter has been put into operative position by the filling-feeler, and they should engage one another just as the lay reaches the front center. The starting-rod will then be turned, and the shuttle-feeler and latch will be positioned the same as on non-feeler looms. The shuttle-feeler, however, will be made in the form of a thread-cutter, and the bunter on the lay is of special construction, as it not only engages the latch but also operates the thread-cutter. The only difference which this makes in the setting of the shuttle-feeler is that care must be taken, so that it will both cut the thread at the proper time and prevent bobbin transfer when the shuttle is not properly placed. This can be readily done by raising or lowering the thread-cutter, or by slightly changing its angle to throw it further forward or back, as necessary.

The rotation of the hopper should always bring a bobbin into proper position. The bearings should be kept properly oiled, care being taken not to drip oil on the bobbins. If the weavers leave gaps between bobbins when filling the hopper, it may cause trouble. They should not allow these gaps to occur, as it is perfectly easy to turn the hopper back and fill it properly.

WARP STOP MOTION.

The warp-stop motion on the Northrop loom is mechanical throughout, depending upon the support of a thin steel wire or heddle by an unbroken thread. If the thread breaks, the drop wire or heddle drops a predetermined distance into the path of a moving detecting apparatus, the stoppage of which causes the stopping of the loom. Three types of warp stop motion are used on the Northrop looms, known as the steel harness warp-stop motion, the cotton harness stop motion, Roper type, and the single thread stop motion.

With the steel harness warp-stop motion the heddles themselves are used as detectors to effect the stopping of the loom if a warp thread breaks or becomes too slack. This style of stop motion may be used on two harness, three, four, or five harness work. The heddles of the steel harness are suspended by the heddle bars which pass through slots in the upper part of the heddles, the warp threads being drawn through the eyes near the center. The lower ends of the heddles are free from the moving frame, but are guided by stationary devices which prevent their swaying too much either forward or sideways. Between the harnesses is a long, flat casting called the stop motion girt, which serves two purposes; first, to separate the harnesses and hold them in position, and second, to resist the action of the feeler bar when a heddle drops down and is caught between it and the girt, which happens when a warp thread breaks. On the lower edge of this girt is fastened a strip of sheet steel having serrated edges, which is called the serrated bar. The edges of the feeler bars are also serrated, and this construction prevents the heddles from slipping or twisting when engaged by the feeler bars.

Upon the cam shaft is the oscillator-cam upon which the oscillator-cam follower works. The latter through the oscillator rod, operates the feeder bars. This cam-follower is held against the cam by means of the oscillator spring. Adjacent to this cam, and forming a part of the same casting, are two projections. Normally these projections just clear the knock-off, which is a small casting fastened to the same stud or shaft that holds the cam-follower. When a heddle drops, the feeler bar strikes it, and the cam-follower is thus prevented from following the cam. The knock-off on the shaft with the follower is thereby moved out of its normal position in such a way as to be struck by one of the projections attached to the cam, thus moving the knock-off link on which the cam-follower and the knock-off are mounted. This motion of the link is communicated to the shipper handle, throwing the belt on to the loose pulley. When no heddle is down, the feeler bars oscillate back and forth, and keep the knock-off out of the way of the projections or lugs on the hub of the oscillator-cam, and the loom continues running.

In setting the steel harness stop-motion, the first thing to do is either to throw off the belt, or remove the key

which holds the end of the shipper-lever in the shipper-handle, and place the shipper-handle in the notch in the shipper-lock; this will bring the stop-motion parts into the same position as when the loom is running. Then turn the loom until the feeler bars are in their extreme forward position under the girt. The knock-off link should be against its bearings in the hub of the cam, and the cam-follower should bear against the cam in its lowest place. The small casting on the same stud with the cam-follower, called the knock-off, should be so set that it will just clear the projections on the hub of the cam as the cam revolves on the cam-shaft.

The cam on this stop-motion is very similar to that used with the cotton harness stop-motion. The position of the oscillator cam is governed by the setting of the harness cams and should work in conjunction with them. When the harnesses are level, or passing each other, the oscillator cam should be so set that the long axis of the cam is horizontal, that is, so that the faces of the cam point directly to the front and back of the loom on a line parallel with the floor.

The cam-follower is held in position by a spring on the stud to which it is fastened; if it does not follow the cam as quickly as it should, tighten this spring. Care should be taken, however, not to have too much tension on this spring but just enough to make the cam-follower work properly; otherwise the heddles may be bent by the force of the blow. The motion of this cam-follower is communicated to the feeler-shaft by means of the oscillator-rod, the length of which may be varied at will by means of the oscillator-rod-coupling.

On each side of the stop-motion girt, under the warp and just touching it, are the front and back rods, which hold the heddles in place so they will drop into position to be caught by the feeler bar if a thread breaks. These rods also hold up slack threads which otherwise might allow the heddles to drop low enough to stop the loom.

Small castings called heddle-bar collars are placed on the heddle-bars to keep the heddles in line with the yarn. There is also a heddle-box-block at each end of the stop-motion girt to keep the bottom part of the heddles in line.

The harnesses are allowed to cross at various positions of the crank, on underthrow looms from the bottom center to the front center, and on overthrow looms from the top center to the front center, according to the class of goods to be woven.

The front heddle-bars are smaller than the back bars, and must be set in their proper position.

The front and back rods should be set just high enough to touch the yarn when the yarn is in its proper position on the race-plate.

If the shade should be too high above the race-plate, it can be lowered by turning down the set screws in the castings, at each side of the loom, upon which the harness-roll-shaft rests, and then tightening the connection between the harness yoke and treadle. To do this, raise the cam having the spring on top and turn it. If the shade should be too low loosen the connection between the harness yoke and the treadle and raise the harness. The shade should just clear the race-plate. A great advantage with the steel harness is, that after the shade is once set it requires very little or no attention, and new warps can be put in without altering the shade, and more quickly than with any other harness made. In putting in a warp, however, it is possible to get it tangled up; this can be avoided by a little care and common sense on the part of the operative. After the warp is once placed in the loom there is no danger of tangling.

The bottom connection of the front harness should be placed in the second notch in the treadle and the back one in the fourth notch.

The heddle-bars must be straight. If the heddles bind in any way on the heddle-bar, they will cause reedy cloth and also a serious strain on the yarn. No oil should be put on the heddles or heddle-bars.

It sometimes becomes necessary to apply a heddle to the harness after the warp has been drawn in, and this is usually done by breaking open the slot and slipping it onto the bar. While this is all right as a temporary expedient, it is well to go over the harness in the drawing-in room before re-drawing, and remove such heddles, as they are liable to catch in adjacent heddles, and interfere with the proper action of the warp-stop motion.

COTTON HARNESS STOP-MOTION, ROPER TYPE.

With this attachment the ordinary twine or cotton harness is used, the stop-motion being applied between the harnesses and the lease rods, two or more threads being drawn through each drop wire. The threads in this stop-motion pass through long slots in the wires instead of round eyes, there being two such slots,—one for the passage of the threads, and the other for the passage of the drop-wire bar. Sometimes a separate free bar or weight passed through the lower slot is used, which rests on the drop-wires to keep them vertical in action.

The stop-motion girt, knock-off, etc., are similar to those already described. A back rod or warp support is also used, as with the steel harness. The stop-motion girt can be raised or lowered, and should be set in position for the feeler-bar to clear the drop-wires when the shade is wide open and no warp threads broken. It should also be set high enough so that when the shade is wide open it will not pull the drop-wires up to their full limit on the drop-wire bar. This can also be adjusted backward or forward so as to give room for additional harnesses. The feeler-bar, which is a piece of sheet steel bent at right angles, with teeth in the edge, should be set so that when it has reached the end of its forward movement, it will be under the girt and close to it. While this form of stop-motion will apply for many forms of three, four, five-harness weaves, there are special classes of shedding to which it will not apply.

SINGLE THREAD STOP-MOTION.

The single thread stop-motion can be used with any style of weaving, including dobbies and Jacquards.

With this construction there is one detector or drop-wire for each thread. It is applied in several ways, the most common method being to arrange the drop-wires in two banks, using them to also do the leasing in place of the ordinary lease rods; three banks may be used if necessary. When using two banks, there are front and back box plates instead of a center girt. The feeler-bar is different; it being flat instead of bent at right angles, and it oscillates between the two banks. To prevent the drop-wires from slipping or twisting when engaged by the feeler-bar, serrated bars are placed on the bottom of of the box-plates. The top edges of the box-plates serve as warp supports. The feeler-bar, having double-action, requires two knock-offs and two oscillator rods between the cams and the feeler-shaft.

In setting this stop-motion, throw off belt or remove key as before, placing the shipper-handle in its notch in the shipper-lock. Set the knock-off link (the long casting forming connection to the shipper-handle), against its bearing on the cam hub so as to have no back lash. Then place the feeler-bar in the center between the box-plates and adjust the two small castings on the feeler-shaft, which are called the tight and loose oscillator fingers. These should project or hang evenly on each side of the shaft. Now loosen the set screw which holds the stop-motion cam on the cam-shaft so as to be able to revolve the stop-motion cam by hand. Set the tight knock-off, the small casting fastened to the stud in the knock-off link by a set screw, so that it will clear the point of the cam hub $\frac{1}{16}$ to $\frac{1}{8}$ of an inch. Turn the cam by hand until the cam-follower

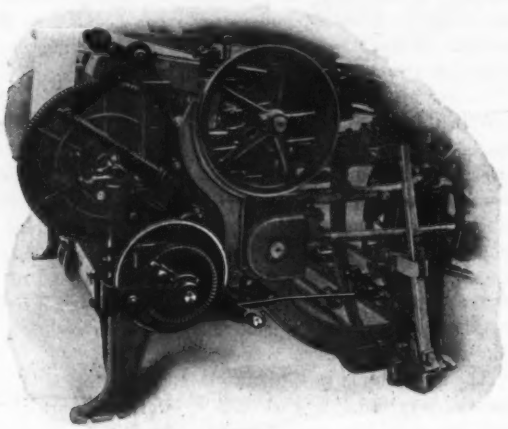


Fig. 3. Roper Type Let Off.

rests on the lowest point of the cam and the feeler-bar is near the back plate. Then connect the loose oscillator finger, that is on the feeler-shaft, with the cam-follower by means of its oscillator rod, and adjust the rod so that as the cam revolves the feeler-bar will be moved from side to side equally.

When this has been done connect the tight oscillator finger that is on the feeler-shaft with the loose knock-off by means of its oscillator rod, and adjust the rod so that knock-off will clear the projection on the cam-hub as the cam revolves. If, when these connections and adjustments are made, the feeler-bar should not move an equal distance each side of the shaft, the trouble may be overcome by further adjusting the oscillator rods. The spring on the stud which carries the knock-off and cam-follower should be set just tight enough, so that the cam-follower will follow the cam properly. The tension of the spring on the loose-oscillator finger on the feeler-shaft should be so regulated that it will hold the two fingers together on the shaft.

LET-OFF MOTION.

Let-off motions may be divided into two general classes, tension and friction. Tension devices are intended to let off a definite amount of warp at each stroke of the lay. It is evident that as the warp beam runs out, it is necessary to turn it faster in proportion to the reduction in diameter, as there must be more movement when nearing the empty beam, in order to feed off an equal amount of yarn. With the Bartlett let-off it is necessary to regulate the tension by the adjustment of the collar on the trombone as the beam weaves off, so that enough teeth of the ratchet will be taken up each time to give the beam quicker rotation. Approximately, the warp beam should turn about three times as fast when empty as when full, and when full should move at least one tooth of the ratchet at each motion of the lay. Improper delivery of yarn will cause uneven strain in cloth, making it vary in width, and increasing warp breakage. Sufficient friction should be put on the let-off wheel to pervent it from running past the point where the pawl leaves it.

The let-off motions that the Draper Company now use are the Bartlett, friction with rope chain or leatheroids, and their latest mechanism called the Draper-Roper self-adjusting let-off. The self-adjusting let-off is what its name implies; that is, when the tension is once set, there is no need of again adjusting it for the goods being woven.

The application of the Draper-Roper let-off to the loom is shown in Fig. 3. In attempting to perfect a let-off mechanism that should be fully automatic, using an even amount of strain by gradually changing the leverage as the let-off devices received greater motion, a follower or pressing-arm resting against the yarn on the beam and changing its position as the yarn circle varied has been incorporated in the motion. Change of position of this presser changes the fulcrum of the lever operating the let-off pawl, and practical tests have shown that goods can be woven with even tension, other conditions remaining the same. The let-off, of course, does not govern all conditions affecting width of cloth, as this may be varied somewhat by the amount of moisture in the filling, the set of the pick, etc. The Draper Co. has perfected the details of this motion by providing an outside bearing and also by furnishing an ingenious hand-operated clutch by which the beam can be easily released for turning backwards or forward.

TAKE-UP.

There are a number of take-up motions which may be applied to Northrop looms, the particular motion used depending on the model of the loom and the goods to be woven. Most of the take-ups are of the high roll type. As the general operation of the different take-ups is very similar, we will here describe in detail only the one in most common use—the high roll, spur gear take-up with over pick take-up pawl. The same take-up with an under-pick take-up pawl is also largely used, the only difference being that this pawl acts on the underside of the pick-wheel, its active stroke thus coming with the forward instead of the backward beat of the lay.

With this take-up, the take-up roll is placed next to and inside of the breast beam. This take-up roll has a gear at one end, which meshes with an intermediate gear, and this in turn meshes with the change gear, the latter being driven by the pick-wheel which is located half way between the front girt and breast beam. The pick-wheel is operated by the take-up pawl which is attached to the lay sword, and as the lay swings back, takes up one tooth at every pick. The pick-wheel is prevented from letting back by the hold-back pawl which is fastened to the cloth roll stand. Inside of the hold-back pawl and on the same stud is the slack pawl. When the filling breaks, the hold-back pawl is lifted, allowing the slack pawl to let back the ratchet wheel from one to three teeth, as the quality of the cloth may require, thus avoiding cracks or thin places.

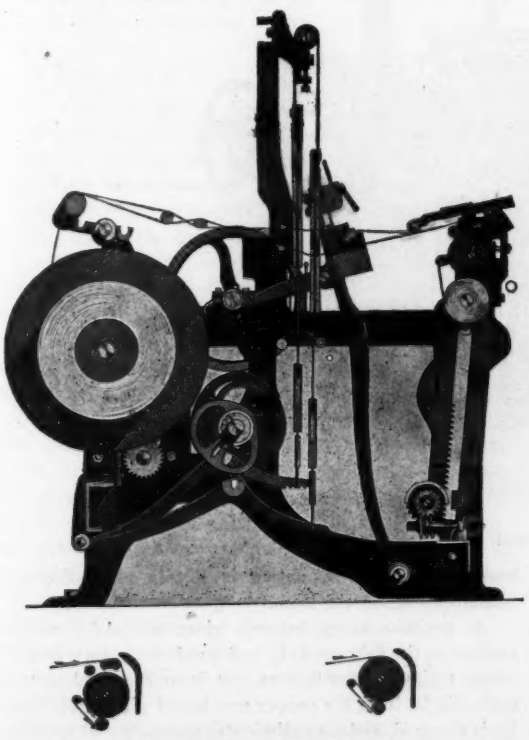
The change gear is composed of two gears in one casting, one of which meshes into an intermediate gear and

the other into the gear on the hub of the pick-wheel. This gear is held in place on a swinging or half-circle stand. Each tooth on one end of the change gear usually represents two picks; for instance, for 64 picks use a 32-tooth change gear, and a 50 gear for 100 picks. Sometimes a pick-wheel is used in which one tooth on the change-gear represents one pick in the cloth.

After leaving the take-up roll, the cloth is wound on a smooth iron roll called the cloth roll which is held against the take-up roll by the cloth roll racks. The cloth roll has teeth cut in one end to be turned by gear teeth on the take-up roll heads, so that the cloth roll will get a positive rotation while starting to wind the cloth. As soon as a little cloth is wound, these teeth will not mesh and the rest of the cloth will be wound by friction alone.

The cloth roll racks have teeth meshing into gears at each end of the spring shaft. The spring is wound by a gear and worm wheel and handle attached to the front girt. When not in use, the handle can be put into the notch provided for it and be out of the way of the operative. Cloth can be removed from the roll at any time, the weaver taking off cuts when convenient. As the take-up roll is made of metal, it will not change on account of the weather like a wooden one. The fillet is fastened to wooden plugs inserted into holes in the metal roll.

The take-up roll is adjustable vertically and can be raised or lowered to adjust the level of the cloth on the lay and give cover. This take-up is usually made so that the cloth can be run over several stationary rolls before having any contact with the take-up roll, so as to give more stretch to the cloth between the take-up roll and the lay, which is desirable on certain classes of goods, but the cloth can be run direct to the roll if desired. The pressure due to the spring on the spring shaft may be varied by turning the collar to which it is fastened.



NORTHROP LOOM CUT MOTION.

When the take-up roll is empty and the cloth roll is forced up against it, the worm on the spring shaft should be in such a position that the handle by which it is turned will go into its notch. The slack pawl has three small holes through it in one of which a cotter pin is placed. Each of these holes represents one tooth on the pick-wheel; that is, if the cotter pin is in the the first hole, when the loom stops, the take-up will let back one tooth. If in the second hole, two teeth, and in the third hole, three teeth. The cotter pin is placed according to the demands of the cloth. When setting the let-back, turn the loom until the filling cam follower or weft hammer is in its position nearest the breast beam. Pull the filling fork up over the hook on this cam follower and the change mechanism will now be in operative position.

There is a pawl-raising finger fastened to the starting rod by a set screw which should be turned until it extends under the end of the take-up pawl and lifts it out of its engagement with the pick-wheel. The take-up pawl passes under a lateral lug on the hold-back pawl, and as the former is lifted, it in turn lifts the hold-back pawl out of engagement with the pick-wheel, which is then free to turn backward as far as permitted by the slack pawl. This accomplishes the letting back of the take-up at the time transfer takes place. The take-up should be looked after from time to time with great care to see that the pawl is actually thrown out of engagement every time there is a transfer, thus allowing the pick-wheel to turn back as described. If this is neglected thin places in the cloth will certainly be caused.

SPEEDS FOR DRAPER LOOMS.

Name of Loom	Picks per Minute	Name of Loom	Picks per Minute
28 inch	190 to 195	60 inch	128 to 132
30 "	185 to 190	64 "	124 to 128
32 "	180 to 185	68 "	120 to 124
34 "	175 to 180	72 "	116 to 120
36 "	170 to 175	76 "	112 to 116
38 "	165 to 170	80 "	108 to 112
40 "	160 to 165	84 "	104 to 108
42 "	154 to 158	88 "	100 to 104
44 "	148 to 152	92 "	96 to 100
46 "	144 to 148	96 "	94 to 96
48 "	140 to 144	100 "	90 to 94
52 "	136 to 140	104 "	88 to 90
56 "	132 to 136	108 "	86 to 88

Treating the wool in closed machines has done much to keep the fibers open, as with this method thorough boiling may be given with a minimum of movement to the wool.

In piece dyehouses, taken generally, a more rapid formation of steam takes place than when the material is dyed in the form of hanks or raw-stock.

The less boiling given to loose wool the freer are the fibers, and the easier are they to spin.

The spindles should be set in the center of its mate ring, and the guide wire properly adjusted.

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In order to produce good yarn, and this of a uniform shade, the work must be started right at the mixing room.

STAFFORD "IDEAL" AUTOMATIC LOOM.

(*Contributed exclusively to* COTTON.)

The distinctive feature of this loom, shown in Fig. 1 is, that it changes the shuttle when the filling runs out or breaks. The change of shuttles is made automatically when the loom stops, and after the change has been made, the loom will automatically start weaving again. The magazine attachment is located on the loom breast beam. Eight standard loom shuttles which have previously been loaded by hand with either cop or bobbin filling are manually placed in the magazine.

The filling fork indicates the absence of weft in the usual way, and the loom stops with the shuttle in the box at the magazine end. The operation of the loom is similar to that of a plain loom until such time as the filling yarn breaks, then the automatic features are brought into action. As soon as the loom stops, the front board is raised and a lever ejects the shuttle from the loom and another arm moves from the magazine a fresh shuttle which is carried forward by a conveyor and placed in the shuttle box. The loom then automatically starts in operation. Sufficient time is taken to eliminate sudden and violent movements and the change of shuttles is effected without any strain on the loom or the automatic mechanism. The danger of breakage of bobbins, castings, shuttles, or injuries to the warp or filling is reduced to a minimum.

The mechanical means for effecting the change of filling consists principally of a shaft extending the full width of the loom and cams mounted on the shaft, controlling the shuttle changing device. There are three cams used in this connection; two are cast together, and the third is locked in such a way that it is impossible for them to get out of time. A single turn of the cross shaft completes the operation of changing the shuttle, after which the motion is thrown out of action until the fresh supply of filling is exhausted. It will be seen from this that there is slight wear on the automatic device. Except during the brief period when it is called into play to change the shuttle, it is disconnected and has no work of any kind to do, being in fact an entirely distinct mechanism without connection with the ordinary weaving features of the loom.

The loom is equipped with a mechanical warp stop motion of simple design, being positive and immediate in its action. Every end of the warp is controlled by one drop wire. The stop motion is so arranged that on the breaking of a warp end, the loom stops, rendering it necessary for the weaver to piece the broken end before the loom is restarted.

After the change of shuttle, the new shuttle, as it enters the box, leaves a thread extending from the magazine to the shuttle box. In order to sever this thread the temple at the magazine end is provided with a cutter, so arranged that on the first pick after the new shuttle is in place, the end of filling referred to is carried into the path of the knife and cut. This cutter is combined with the regular construction of loom temples.

All looms are equipped with friction pulleys and belt as required, either from above or below. The pulley runs on a sleeve which fits over the crank shaft, so that the wear instead of coming on the shaft, is taken up by the sleeve which can be replaced at a small expense when it becomes necessary. A 14-inch pulley is usually supplied.

The shipper motion on this loom is of the forward pull variety, and is very easy to operate.

The loom is supplied with a powerful brake which acts in combination with the shipper, and when the shipper is thrown off, the brake acts and stops the loom approximately on the back center, where the change of shuttle is effected. The brake is of the "shoe" variety; the shoe is supplied with a leather friction which comes in contact with a broad brake wheel, and its action is certain and effective, yet without strain on the loom.

A positive worm take-up gives a steady, continuous motion to the take-up roll, and produces a very even cloth, owing to its positive motion. It is so arranged as to automatically let back the proper number of picks when the shuttle is changed, and thus eliminates possibility of making thin places. The take-up roller is of metal, covered with per-

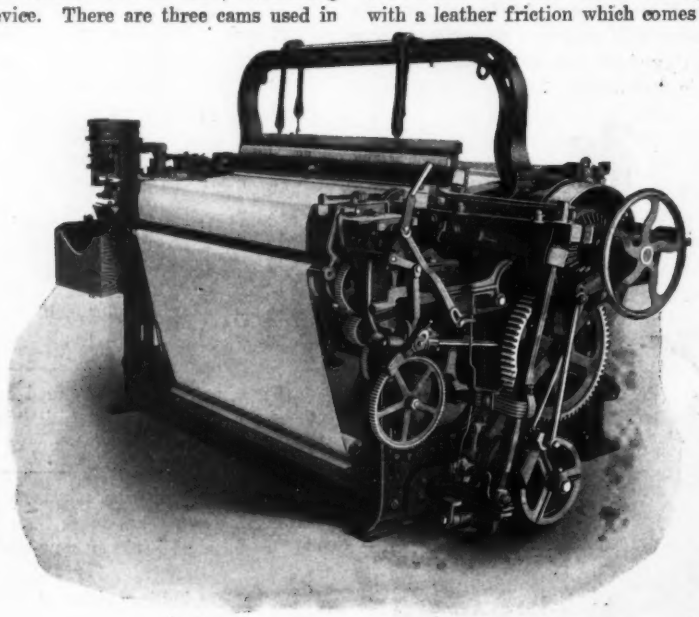


FIG. 1. STAFFORD PLAIN GOODS LOOM.

forated steel, which is another factor in procuring even cloth, as the metal is not affected by atmospheric conditions as is more or less the case where the ordinary wood roll is used. The take-up provides for a large roll, 16 inches in diameter.

The gearing of the take-up motion is arranged so that one tooth in the change gear represents one pick in the cloth. Fig. 2 shows a plan and side view of the gearing. The motion is operated from the pick cam shaft, each revolution of which equals two picks in the cloth. A 24-gear on the pick cam shaft drives another 24-gear, which is on the same shaft with a single pitch worm. This worm drives a 90-gear located on the same stud with a 30-gear, which through an intermediate gear, drives the pick change gear. This in turn is on the same stud with a 32-gear, which drives a 76-gear on the same shaft with the sand roll, the latter being 14.25 inches in diameter. The calculation for a constant is as follows:

$$\frac{76 \times 90 \times 24 \times 2}{32 \times 30 \times 1 \times 24 \times 14.25} = 1 \text{ Constant.}$$

To find the number of teeth in the pick change gear to produce a required number of picks per inch in the cloth, multiply the constant by picks per inch required.

Either a Bartlett or a friction let-off is applicable to this loom. Upon the broad loom, where two beams are used, a compensating let-off is provided, thus regulating any difference in the size of the beams.

The picking motion has been designed to provide an easy, even pick, which is apparent when the looms are running at high speed.

The picking cams are keyed to the bottom shaft, as well as set screwed. The toes of the pick cams are made of a special hard iron to guard against wear, and are made adjustable. Picker sticks are made of tough native hickory.

The lay is made of tough white ash and is fitted with either a wood or steel race-plate. The shuttle boxes are of iron with back binder and maple swell, faced with a leather friction. The hand rail is of ash and is furnished with the regulation shuttle guard. The pitmans are provided with metal straps and regulating bolts to prevent back lash which is so often found in looms. This has been found to be a very effective way of overcoming this objectionable condition.

The loom is equipped with an adjustable vibrating whip roll made of wrought iron pipe, ground and polished to a smooth surface. It has a very simple adjustment, making it susceptible of being raised as desired.

Experience has shown that a weaver can run from 14 to 34 "Ideal" automatic looms, depending on the width and style of cloth made.

Any style of shuttle may be used. Ordinarily, one of the hand-threading type is employed, but this is not essential. There are several shuttles of the hand-threading kind that are efficient aids to economical weaving and their use is constantly increasing.

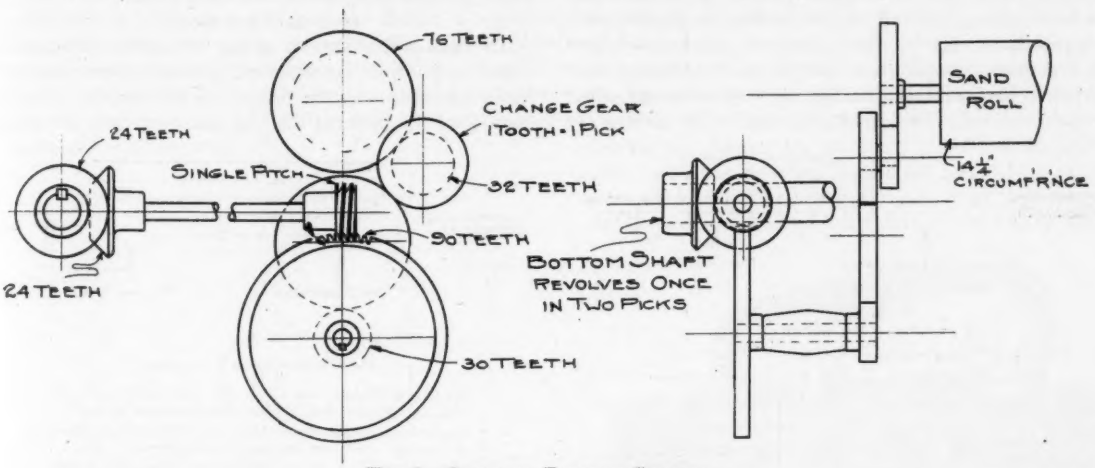


Fig. 2. Stafford Take-up Gearing.

Four distinct types of looms are built: The regular construction; special construction for narrow goods, with the harness curtailed to save floor space, but still sufficient to allow for a twelve-harness dobby if necessary; an intermediate construction for goods from 56 to 72 inches in width, and a heavy construction loom running from 72 to 108 inches.

STAFFORD AUTOMATIC PICK FINDING MECHANISM.

The production of drills, denims, sateens, tickings, etc., requires the use of from three to five harnesses in a loom, and the attention required in weaving is increased over plain weaving, owing to fact that the correct shed for the insertion of the first pick from a fresh shuttle has to be found, in order to produce satisfactory cloth. In the ordinary loom, the weaver in a great many cases stops the loom just before the filling is entirely spent, and replaces the empty shuttle with a fresh one. When the filling is entirely exhausted and the loom stops, the weaver has to turn the loom until the proper shed, where the filling ran out, is open. He then enters the shuttle and starts the loom.

The object of the automatic pick finding device, which is made by the Stafford Co., Readville, Mass., is to perform mechanically what was required of a weaver, that is, find the proper shed before the fresh filling is started into the cloth.

The great advantage of the pick finding motion is that it renders possible making three, four and five-harness goods without the expensive and undesirable features inseparable from a feeler motion. The waste and expense of stripping

the bobbins where the latter device is used is quite an item. The fact that the feeler motion is a device requiring delicate adjustment and unusual care to keep it in running order presents conditions that must be taken unto consideration when using this motion for making goods of the kind referred to on an automatic loom.

The pick finding device is entirely new in conception, and can only be used with the "Ideal" automatic loom, and it is broadly controlled by the makers. The main principle of the device is that the change of shuttle, after the filling has been entirely run off of the bobbin, is delayed until it is possible to place a fresh shuttle in the box and have the first pick from the new shuttle go through the same shed that the spent shuttle was traveling through when the yarn ran out. This result is arrived at by picking the

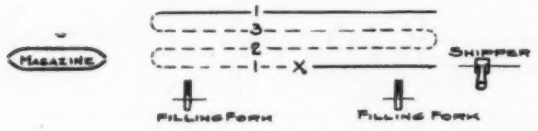


FIG. 1.
3 HARNESS WORK
FILLING RUNNING OUT (X) WITH SHUTTLE TRAVELING TOWARD MAGAZINE END
DOTTED LINES SHOW EMPTY SHUTTLE PICKED TWICE AFTER FORK INDICATES.
FIGURES 1-2-3 INDICATE THE SHEDS.

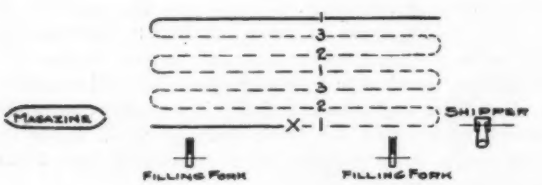


FIG. 2.
3 HARNESS WORK
FILLING RUNNING OUT (X) WITH SHUTTLE TRAVELING TOWARD SHIPPER END.
DOTTED LINES SHOW EMPTY SHUTTLE PICKED 5 TIMES AFTER FORK INDICATES
FIGURES 1-2-3 INDICATE THE SHEDS.

the loom to effect a change of shuttles, consequently the empty shuttle has to be picked three more times. This brings it into the magazine end box, and also brings the proper shed up again.

The loom now stops, the empty shuttle is ejected, a new one carried into place, and the loom restarts automatically. Consequently, no matter which way the shuttle is traveling, there will be no mispicks, but there will be occasional double pick, which in the great majority of goods, however, does not constitute a defect.

FOUR-HARNESS GOODS.

In making four-harness goods, two filling forks are required, as on three-harness work, although a somewhat different situation is met in finding the proper shed. In this case, it will be observed that the order in which the shuttle

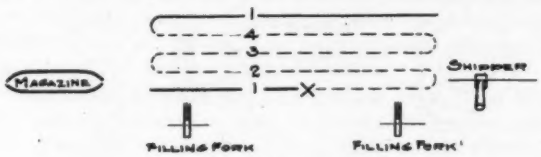


FIG. 3
4 HARNESS WORK
FILLING RUNNING OUT (X) WITH SHUTTLE TRAVELING TOWARD SHIPPER END.
DOTTED LINES SHOW EMPTY SHUTTLE PICKED 3 TIMES AFTER FORK INDICATES
FIGURES 1-2-3-4 INDICATE THE SHEDS

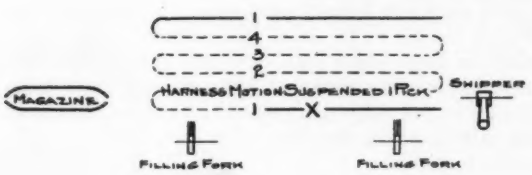


FIG. 4
4 HARNESS WORK
FILLING RUNNING OUT (X) WITH SHUTTLE TRAVELING TOWARD MAGAZINE END.
DOTTED LINES SHOW EMPTY SHUTTLE PICKED 4 TIMES AFTER FORK INDICATES.
FIGURES 1-2-3-4 INDICATE THE SHEDS

DIAGRAMS SHOWING THE WORKING OF THE STAFFORD PICK FINDER.

spent shuttle a prescribed number of times after the filling fork has indicated, until the proper shed has come up again, and the shuttle is in the box at the magazine end ready to be changed.

Immediately the filling fork indicates the absence of filling, the take-up and let-off motions are thrown out of action, so that the possibility of thick and thin places is eliminated. The empty shuttle will be picked from two to five times, depending upon circumstances, before it is ejected and a new one put in place.

In making three-harness goods, two filling forks are used, and if the shuttle is traveling towards the magazine end when the yarn runs out or breaks, it is picked twice more before the loom stops and makes a change. This condition is shown in diagram Fig. 1.

When the shuttle is traveling towards the shipper end, however, it will be seen from Fig. 2 that if only two extra picks are made, the shuttle will be at the wrong end of

is picked from either side is never varied; in other words, if sheds 1 and 3 are picked from the magazine end, sheds 2 and 4 must always be picked from the shipper end or vice versa. Accordingly, if the filling runs out with the shuttle traveling towards the shipper end as shown in Fig. 3, the loom makes three picks with the spent shuttle, which brings it into the box at the magazine end, when the new shuttle is inserted in the usual way, and the loom restarts weaving.

If, however, the filling breaks with the shuttle traveling toward the magazine end as shown in Fig. 4, it is clear that picking the empty shuttle a prescribed number of times will not alter the order of the picking so that the shuttle will never be at the magazine end at the proper time to effect the change, and have the first pick from the new shuttle go in the same shed as the last pick from the old.

Means, therefore, have to be introduced to reverse the

order of the picking. This consists of a device that suspends the action of the harness cams for one pick, so that when the filling fork indicates absence of filling, the empty shuttle will be picked four times; the second and third picks, however, will go through the same shed, so that on the fourth pick the loom stops with the shuttle at the magazine end. The next pick, being the first with the fresh shuttle, is sent through the same shed that the break occurred in.

FIVE-HARNESS GOODS.

In making five-harness goods a single filling fork is used. If the filling runs out when the shuttle is traveling toward the magazine end as shown in Fig 5, four picks are made with the empty shuttle. This brings the shuttle into the proper box to effect the change, and the next pick, being the first from the new shuttle, goes in the same shed where the break occurred.

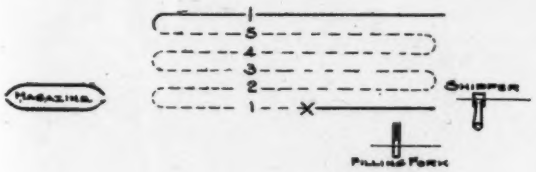


FIG 5
5 HARNESS WORK
FILLING RUNNING OUT (X) WITH SHUTTLE TRAVELING TOWARD MAGAZINE END
DOTTED LINES SHOW EMPTY SHUTTLE PICKED 3 TIMES AFTER FORK INDICATES.
FIGURES 1-2-3-4-5 INDICATE THE SHEDS.

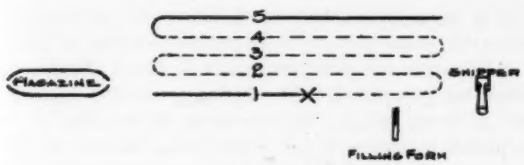


FIG 6
5 HARNESS WORK
FILLING RUNNING OUT (X) WITH SHUTTLE TRAVELING TOWARD SHIPPER END
DOTTED LINES SHOW EMPTY SHUTTLE PICKED 3 TIMES AFTER FORK INDICATES
FIGURES 1-2-3-4-5 INDICATE THE SHEDS

PICK FINDER DIAGRAMS.

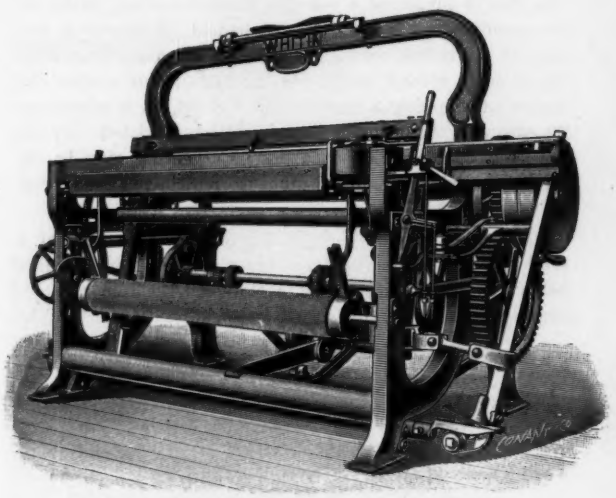
When the shuttle is traveling in the opposite direction, towards the shipper end as shown in Fig. 6, only three picks are made with the empty shuttle before the change takes place. This results in the first pick from the new shuttle going in the shed first before the one where the filling gave out. In five-harness goods the individual pick is to a very large extent buried in the fabric, so that this feature does not assume the importance it would were three or four harness goods in question.

In actual practice the sucess of the loom on five-harness goods has been marked. Weavers have run as many as 26 looms each, and taken off a most satisfactory production both as regards quantity and quality of cloth.

Inquiries about anything pertaining to the textile industries will be cheerfully answered by COTTON.

WHITIN HEAVY PATTERN LOOM.

This loom is designed for weaving standard sheetings, shirtings, drills, twills, etc., and is made in different widths from 28 inches to 70 inches. The sides and arch of this loom are made very heavy in order to stand the high speed of running demanded, and the extra strain thereby induced. It has the ordinary cam harness motion, and by the use of a short auxiliary cam-shaft, geared to the main cam shaft, can be readily and quickly changed to three, four, five, or six shed work as needed, the cams being made in sets, that are interchangeable with each other to further facilitate this arrangement. Weavers who have been called upon to make changes in twill work realize the advantages of this construction. The cam shaft is not disturbed in the least in making the change, the necessary gears for the different sheds being put on when loom is set up, thus doing away with all trouble of re-setting the pick cams, eccentric, cam-shaft boxes, etc. The cams themselves have been modeled so



WHITIN HEAVY PATTERN LOOM.

as to give the easiest harness motion possible. When desired, the loom is made with an adjustable arch, by means of which extra harness space may be obtained.

This loom is usually built to "protect" from the breast beam, that is, the stop motion is located at the center of the breast beam, and the swell on the shuttle box is placed at the front. However, the loom may be built to "protect" at the side, in which case the swell on the shuttle box is placed on the back of the lathe.

A brake is applied to the driving pulley. An improved Bartlett geared let-off motion is used, or a friction let-off, as may be desired. Friction driving pulley may be had instead of the tight and loose pulley arrangement. The loom may be belted from above or below.

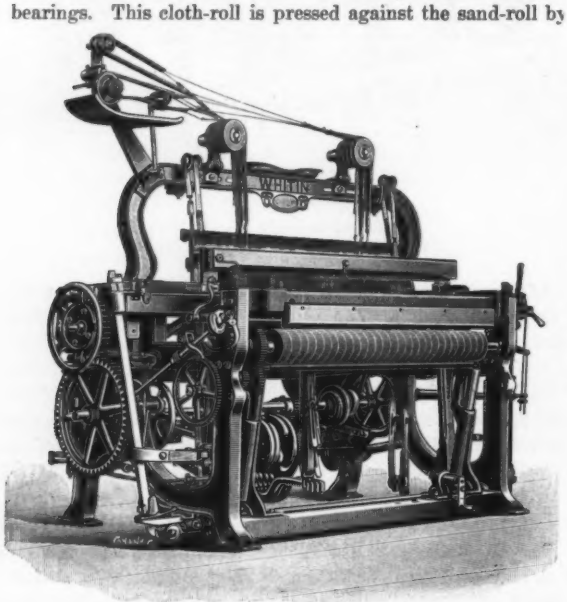
The change pick motion may be arranged so that one tooth in the change gear stands for two picks per inch in the cloth; for example, 50 teeth in the change gear give 100 picks per inch in the cloth. The change gears range from 20 to 54 teeth. The pick motion may be arranged to give any required number of picks per inch, but where more than 108 or less than 40 picks per inch are required, the ratio between the change pick gear and the number of picks in the cloth, will not be constant as above.

WHITIN SATEEN LOOM.

This loom is designed for weaving sateens, sheetings, twills, etc. It is built in either the standard or Ponemah sizes, the latter having 3 inches more harness space, which permits the use of dobbies with a large number of harnesses. The sides and girts are extra heavy, thereby reducing vibrations to a minimum. The crank-shaft is of large diameter and runs in boxes with caps which permits the removal of the shaft with little difficulty. The lathe is built in a substantial manner and is provided with an extra heavy reed cap, iron race plate, and shuttle boxes with iron or wooden backs and adjustable front swells. The warp beams are from 12 to 17 inches diameter, and are held in position by the Owen patent retaining device. The let-off motion may be either the Bartlett or friction let-off, or a combination of both.

For weaving goods from plain, up to six harness twill the loom is usually equipped with a regular top harness motion, but if preferred a side-top harness motion, shown in the accompanying illustration may be had. The take-up motion, as illustrated, consists of a side shaft and worm, driving a worm ratchet gear. By the use of this motion the chance of skipping a tooth in the ratchet, as is sometimes the case with the ordinary gear, is entirely obviated. By the use of a double pick device the pick gearing may be arranged to give any required number of picks per inch, from 18 to 247.

The Owen patent high cloth-roll motion consists of a sand-roll, 4½ inches in diameter, placed a short distance below the breast beam; and a cloth-roll, held in movable bearings. This cloth-roll is pressed against the sand-roll by



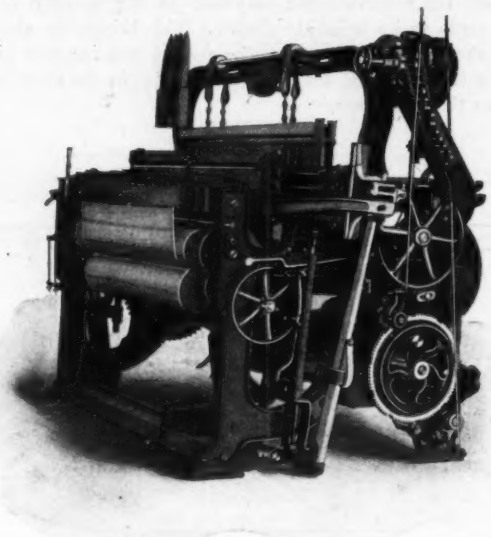
Whitin Sateen Loom.

spiral springs which exert a constantly increasing pressure as the cloth roll increases in diameter. By the use of this motion, access to the inside workings of the loom is easily had, and wrinkling of the cloth as it is being wound is prevented to a great extent. A roll of cloth 13 inches in diameter may be wound on this arrangement. The removal of the roll of cloth is easily accomplished, even while the loom is in operation, by means of a worm. A few turns depress the cloth roll holders, so that the pressure is removed and the roll of cloth may be taken out and a new one started.

WHITIN GINGHAM LOOM.

This loom as shown in the accompanying illustration is particularly adapted for weaving ginghams, cottonades and plaids. It has the ordinary cam harness motion with which from two to six shed work may be woven.

The Crompton box motion of four into one is used. The four boxes and the mechanism for operating them are lo-



Whitin Gingham Loom.

cated on the right hand side of the loom. The shuttle boxes are carried positively into their proper positions by means of sliding gears and eccentrics combined with a lifting lever, motion being imparted to the sliding gears by a mutilated gear on a cam shaft. The changing of the boxes is accomplished by means of a wire connection between the sliding gears and pattern chain mechanism. A break-down stop motion is provided to prevent any damage to the shuttle boxes or box mechanism due to a picker sticking or a shuttle failing to enter a box. The pattern chain mechanism is fastened to the arch and is driven from the cam shaft. A multiplier motion for reducing the length of the pattern chain may be applied if desired. The loom is fitted with patent high cloth-roll take-up motion, friction let-off, beam locks, and friction pulley.

CROMPTON & KNOWLES GINGHAM LOOM.

This loom, as shown in Fig. 1, is designed for plain weaving with one or more colors in the warp and filling, the most usual class of goods being ginghams. In its simplest form, this loom is equipped with two harness cams, located on the pick cam shaft, and treadle harness motion which is operated by the cams. The loom may also be arranged for three, four or five harness, and the usual combinations of drop boxes are readily applied.

The illustration shows a 4x1 box motion attached, with a variable pattern box chain in position for operating the levers necessary for the working of the lower mechanism through the long vertical rods shown. The box motion is

in reality the most important mechanism connected with this loom. The star wheel in the lower mechanism of the box motion is shown very clearly. As will be seen there are two small segment gears located around the star wheel, one being situated at the top front center, and the other at the back bottom center. The long rods extending from the top mechanism are clearly shown, with their connections to the small segment gears. The operation of the top segment gear brings the second box into position, that is, on a line

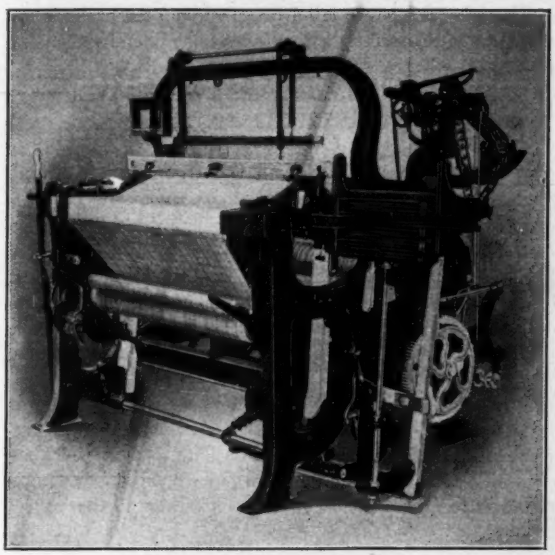


Fig. 1. Crompton & Knowles Gingham Loom.

with the race place; the lower segment gear will bring the third box into position, and both the segment gears working at the same time will bring the fourth box into position.

A special top rigging for the harness may be attached to the loom arches, to take the place of the top roller shaft, as shown in the illustration. This feature is a marked improvement and of importance, especially when the maximum number of harness are used.

The loom has a face friction driving pulley on the crank shaft, the shipper handle being located on the left hand side of the frame. A rope friction let-off for single beam is used, and a positive take-up with a cloth roll over the take-up roll is provided.

CROMPTON & KNOWLES DOBBY LOOM.

This loom, illustrated by Fig. 1, is a standard type in the broad field of fancy cotton weaving for which it was designed.

A characteristic feature of the loom is the combination of a highly developed dobby head with the Crompton type of box motion, so familiar for many years to users of fancy cotton looms, because of the fact that this box motion is fitted to other makes of looms by the Crompton & Knowles Co. The harness chain and drop box chain cylinders are positively connected, thereby maintaining one cylinder in a fixed relation to the other cylinder under all conditions.

A link chain multiplier is used in connection with the box chain, and materially reduces the number of chain bars in any box chain of large size.

The illustration shows a 16 harness loom with a single index dobby and a 4x1 box motion. Another form of dobby which may be used, has two separate harness chain cylinders, which may be single or double index. With the two cylinders it is possible to obtain from one to four different weaves in the cloth being woven, and thus gives a very wide range of weaving effects with a minimum length of chain.

Another point of interest in the construction is a high take-up roll, with a lower cross girt set back of the lay swords, which affords easy access to the under part of the loom. The take-up is positive, and the cloth is wound on a descending cloth roll under the steel surfaced take-up roll by frictional contact. The let-off is of the frictional type with a single beam. The illustration shows only one beam on the loom. When more beams are required, upper beam stands have to be attached to the loom frame, and extra whip rolls provided. A leno motion with one, two or three

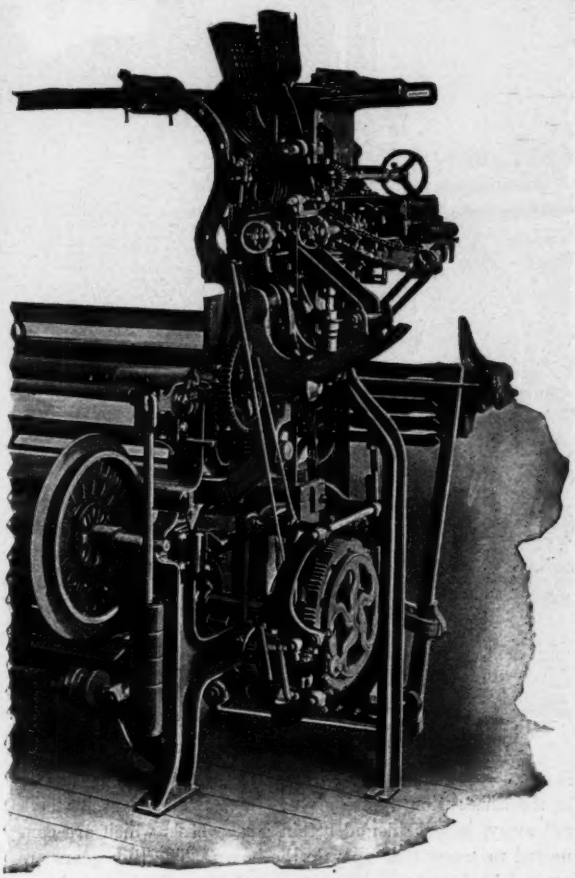


Fig. 1. Crompton Type Dobby Loom.

sets of slackener bars may be applied, when it is desired to weave gauze fabrics.

It will thus be seen that the variety of fabrics that may be produced on this loom is very comprehensive.

For driving the loom a face friction, cone friction, or tight and loose pulleys may be used, to suit the ideas of different manufacturers.

KNOWLES DOBBY LOOM.

This loom, as shown in Fig. 1, is manufactured by the Crompton-Knowles Looms Works, and is designed for

weaving all classes of goods, and especially the highest grades of fancy cottons. While the Knowles looms meet the same general requirements as the Crompton dobby looms, yet they are entirely distinct in point of construction. Both types have been developed to a high state of efficiency, the essential difference being in the types of dobby and box motion used. All of the Knowles looms in this class are equipped with the Providence or Stafford types of dobbies. The Knowles box motion differs from the Crompton star wheel mechanism, by having a gear arrangement, as shown

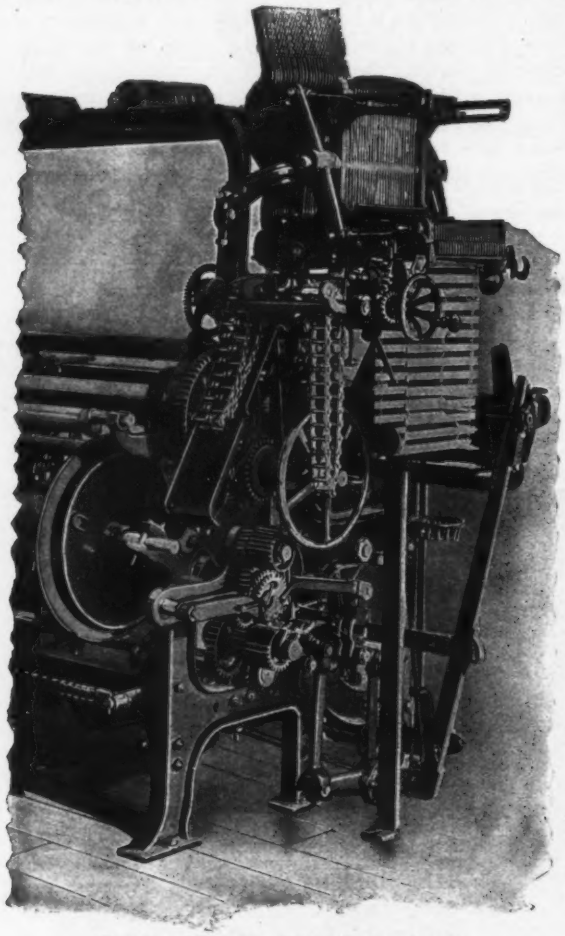


Fig. 1. Knowles Type Dobby Loom.

in the illustration. A revolving gear, with part of its teeth cut away, is located under thin gear wheels which are connected to levers that operate the boxes. The thin gears are carried by levers which are operated from the box chain, so that when the boxes have to be changed, the proper gear is raised into contact with the revolving gear, and the lever operating the boxes is given a movement to secure said operation of the boxes.

The harness capacity of this loom varies from 6 to 30 harness. The builders have a great variety of mechanisms and attachments for this loom in order to meet the requirements for producing different classes of fabrics.

Single or double index dobbies may be had, with additional attachments, if desired, such as two-weave mechanism, reversing dobby chain arrangement, one or multiplier chains for the box motion, leno motion for gauze fabrics, and lappet motion. The dobby frame is of strong construction and is well braced to the loom side.

The dobby drive is so arranged that a warp stop motion may be readily applied without calling for any important changes in construction.

The illustration shows a loom with 42 inches reed space, 25 harness, 4x1 box motion with multiplier, rope friction let-off, and ratchet ring take-up. The loom is built with different widths of reed space, suitable for fancy cotton weaving.

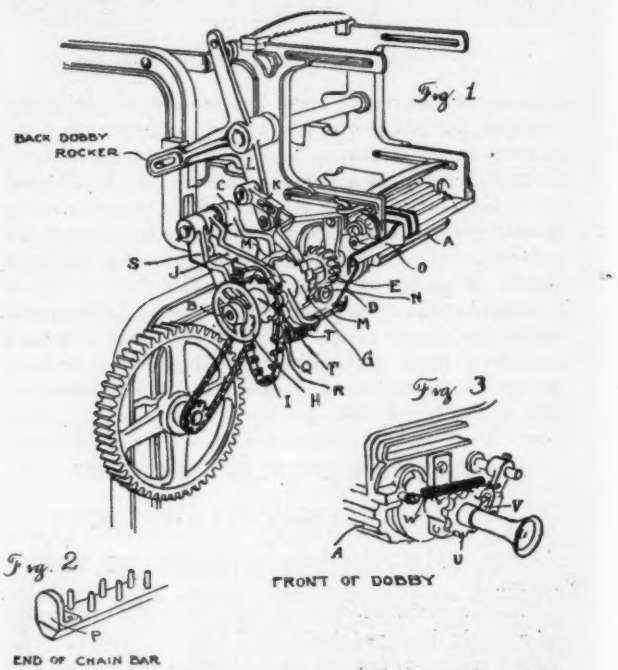
The drive is by face friction pulley, and the brake is arranged to be released by a foot lever or shipper handle.

CROMPTON & KNOWLES TWO-WEAVE ATTACHMENT NO. 13.

Instruction for Applying and Operating the Attachment.

The object of a two-weave motion on a dobby is to provide means for introducing an additional weave effect at intervals in the cloth, without the necessity of having an extremely long harness chain. Arrangement is made to throw the different weaves into operation according to the design desired.

The details of the motion are best shown by means of the accompanying illustrations, Figs. 1, 2 and 3. The pattern chain cylinder A is secured to a long shaft B which extends toward the rear of the loom beyond the dobby frame. The multiplier stand C is located above and to the left of



Crompton & Knowles Two-Weave Mechanism.

the long shaft B, said stand having a small horizontal shaft on which are movably located the checking device S, and the lifting finger J. A worm D, positively driven, is set to engage and drive the worm wheel E, which is secured to the shaft B. The small multiplier chain cylinder F with its ratchet G, is also located on the shaft B in such a

position that the multiplier chain I is in position directly under the lifting finger J. The finger J is thus operated by the multiplier chain I and in turn operates the sprocket chain wheel in and out of engagement with the two clutch collars.

The ratchet pawl K, for operating the multiplier chain I through the ratchet G, is secured to the back dobby rocker L. In its normal position, the pawl K, will rest upon the shoe M, and is thus held out of engagement with the ratchet wheel G. This shoe M, is attached to a collar on the shaft B, another arm extending outwardly from the collar, opposite from the shoe M. A wire connection N, is made from this arm of the shoe M, to the crooked finger O, which is located at the back of the dobby beside the regular fingers. The finger O is operated by means of a

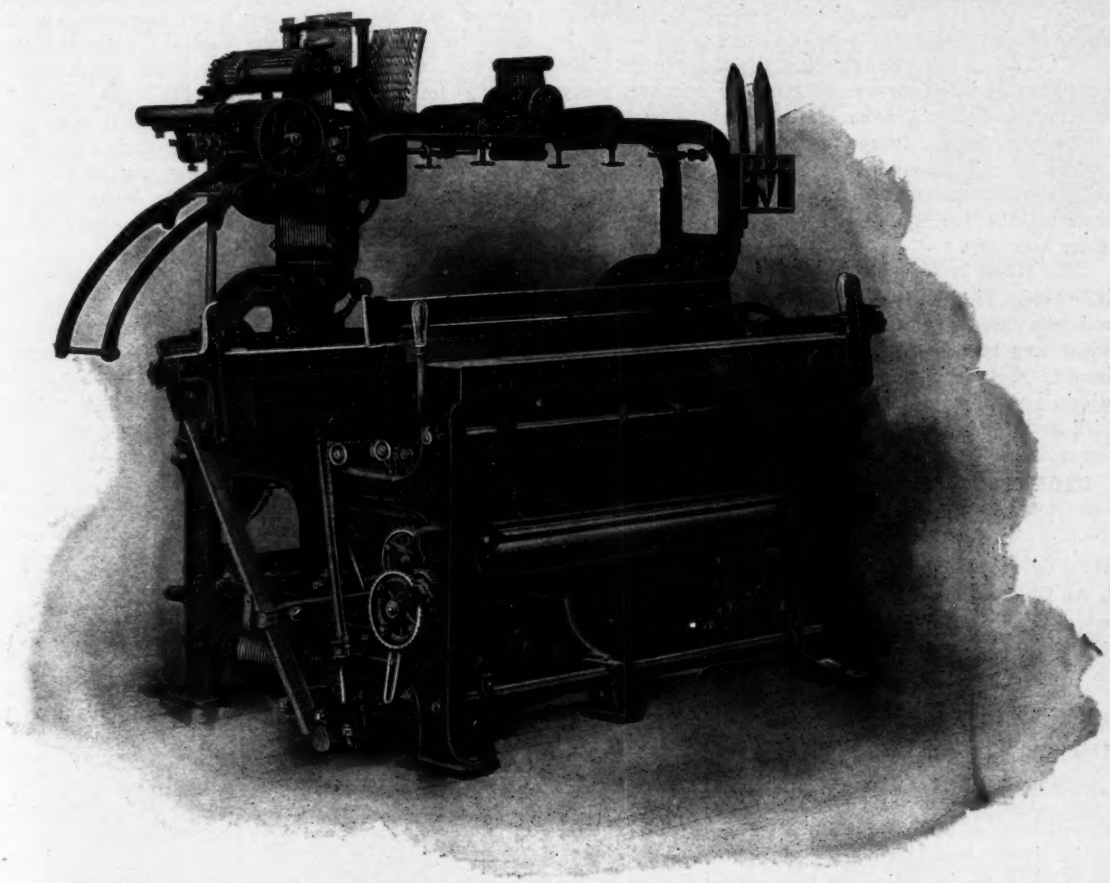


Fig. 1. Crompton & Knowles Gem Loom.

brass extension P, Fig. 2, on the end of the harness chain bar. When this takes place, the shoe M, is lowered, and the ratchet K, engages the multiplier ratchet G. The checking device S, for the small multiplier chain cylinder F, is held against the under side of the ratchet G, by a coiled spring T.

A continuous worm is used when the number of picks in the body of the goods to be woven is a multiple of the number of picks in the border pattern. Thus, if in a certain handerchief pattern there are 200 picks in the two borders, there will be 200 bars of chain required, and the border pattern will be pegged on rows 1, 4, 5, 8, 9, 12, 13, etc. The body of the pattern then should have some number of picks that is a multiple of 200, say 1200, or 1600 which would make 6 or 8 repeats of the chain. The body pattern should be pegged on rows 2, 3, 6, 7, 10, 11, 14, 15. In this arrangement, the chain is advanced one bar for each pick, and the change from one weave to another is accomplished by throwing the clutch from one collar to the other, thus dropping one-half a bar of chain or one row of pegs. It should be understood that where a pattern is found in which it is not possible to make the body of the pattern an exact multiple of the border, the above two-weave arrangement can not be used.

When it is desired to have a plain two-harness weave alternate with a figure, a worm with a dwell is used, which allows the pattern to be pegged on the double index chain in the regular manner. A ball Q on the multiplier chain throws the clutch chain wheel out of engagement with its collar (the other collar having been previously slid out of the way), which will allow the dobby cylinder A to remain stationary. Meanwhile, the chain wheel F, carrying the multiplier chain, is revolving one link for each two picks until a flat link R in this chain allows the collar to engage with the clutch and thus advance the regular dobby chain. It is readily seen that a proper arrangement of the wooden bars with brass extension P, and the metal chain offers a wide scope of multiplication. In the operation of the machine in this way the usual check wheel U, roll V, and spring W, Fig. 3, are necessary to keep under control the dobby cylinder.

Cotton is the leading textile paper in the South.

CROMPTON & KNOWLES GEM LOOM.

This loom is one of the most substantial types of full fancy loom that is built for weaving heavy cotton goods of fancy pattern. It is distinguished from other fancy looms for cotton weaving, by its positive open shed harness motion, the type shown in the accompanying illustration, Fig. 1, being the Knowles Gem 25 harness head, driven from the crank shaft. A description of the working of the harness motion is given in the article on History of Weaving.

The box motion is combined with the harness motion, so that they can not get out of time with each other. The harness motion is positive in both directions. The Gem motion calls for an iron harness chain. It consists of small iron rods for holding the balls which indicate raisers in the pattern, said rods being fastened together to form a chain by means of small links.

The box motion includes a box chain multiplier. The positive character of these motions and the relatively heavy construction make this loom eminently suited for weaving the heavier grades of fancy cottons.

The loom is driven by a face friction pulley on the crank's shaft. A rope friction let-off is used for a single beam with the bearings for the beam shaft in the pockets in the loom side.

The frame is arranged to receive double beam stands if desired. The take-up is positive with a swinging cloth roll over the take-up roll. A brake motion is provided, which may be released by a foot lever or by the shipper handle. A center filling motion is used to prevent mispicks, which is an important item in connection with a pick and pick motion.

CROMPTON & KNOWLES TERRY TOWEL LOOM.

This loom, as its name implies, is designed for weaving Terry or Turkish towels, the chief characteristic of which is the looped or pile surface. The Terry fabric is made in a variety of styles from the plain pile surface to elaborate designs produced either by different colors or by raising and depressing the pile according to the desired pattern.

The essential feature of this loom is the Terry motion for weaving the looped pile on either side of the goods. This motion is also combined with a mechanism for releasing the friction on the upper or Terry beam in the loom. The pawl in the take-up motion is also raised automatically at proper intervals, allowing the woven goods to be drawn back slightly by the let-off weights to a point where the impact of the reed against the fell of the cloth will form the loops on the surface of the towel.

Four harnesses are required for weaving a Terry towel of the simplest design, and for this purpose, cams are generally used. However, dobby and Jacquard motions are used in connection with a Terry loom when fancy designs are desired. A fringe motion is also provided on the loom.

A variety of attachments may be applied to suit different fabrics which are to be woven. Besides a dobby harness mechanism, there could be had a two-weave motion, a counting dial, and a device for weaving plain sections or "leaders" between cuts of towels. The last-named motion provides a suitable protection for the fringe on the end towels in each cut, so that they may be joined together again in one length for the finishing process.

MASON DOBBY LOOM.

One type is made with a standard Mason loom fitted up with a Northrop Filling Supply mechanism and a dobby head. The original inventor of this type of shedding motion was Hattersley of England, and the improved dobby of the present day is in its fundamental principles, simply a modification of the original invention, strengthened and improved, in order to meet the increased demands placed upon it.

As now made, this dobby is capable of weaving a large range of patterns, and requires no extraordinary skill in weaving.

The jack or harness levers in this dobby are similar in design to those in use in other dobbies, and are so constructed that the ribs on the levers keep them in their respective positions, and also hold the compound levers in place. On the jack levers are bosses which serve as bearings for the compound levers. The hooks are attached to the compound levers in such a way that it is not necessary to spring the compound lever apart, in order to put in or take out the hooks. At the same time, under normal conditions, they can not fall out. The hooks have large bearing surfaces, and are made of steel instead of malleable iron.

The oscillating knives for operating these hooks are of chilled iron, and the connections from the knives to the driving lever are also made in such a way that there are no steel pins to become worn; and yet, by the removal of one split pin, the connecting arms can be readily removed from the dobby. The jack levers are pivotally supported on a shaft running through the dobby from side to side, serving also as a girt to the frame. A back shaft prevents the jack levers from falling out of place. The upper hooks, for operating the harness jacks, are controlled by wires running down to the tilting levers, which are in turn operated by the pegs in the harness chain. These wires are guided by passing down through two holes in the cross girts which hold the frame of the dobby together, one girt at the top and the other at the bottom. These cross girts also serve to separate the hooks. The lower hooks are operated by coming directly in contact with the tilting levers, which are operated by pegs in the pattern chain. The upper hooks have their own independent set of tilting levers, operated by a double row of pegs in the chain. The chain barrel is worked by a pawl of novel design attached to the top or the bottom of the rocking lever, operating a ratchet gear placed on the inside hub of the hand wheel. A check roll, bearing against a recess friction wheel, prevents the pattern chain barrel from turning any further than is necessary to bring a pattern chain bar, with its pegs, directly under the tilting levers. The outer guide for the tilting lever also acts as a very convenient leveling device, and rocks on the chain barrel shaft. Attached to this outer guide is a handle extending toward the center of the loom, where it is held firmly in position. Should it be necessary to lift all the harness, this handle may be depressed, which lifts all the tilting levers in the same manner as if a peg should be placed under each lever.

On these looms, the dobby is preferably driven by means of an upright shaft and knuckle joints from the outer end of the pick cam shaft, as being much the cleaner and simpler method. By means of adjusting nuts on each end of this driving rod, this motion can be set, so that there

will be no back-lash. On looms where there is no opportunity to drive from the pick cam shaft, or in any case where it is preferred, the gear, chain, and crank arm, driven from the crank shaft may be used. The strap sheaves are of seasoned hardwood, and are provided with covers, to keep the dirt and oil from the warps.

It will be seen from the illustration that the dobby is placed on the right-hand side of the loom. In building the harness chain to weave a desired pattern, the first hole on the left-hand side of a bar in chain, represents the first harness, and the chain must be made accordingly. This dobby is a single index mechanism, and therefore, one bar in the chain represents one pick in the fabric.

NORTHROP DOBBY LOOM.

This loom built by Draper Co,, Hopedale, Mass., is designated "K" model by the makers, being shown in the illustration, Fig. 1. It will be seen from the illustration that there is an outside bearing for the crank shaft, a double arch for the dobby rigging, and a twenty-five bobbin battery mechanism on the right hand side of the loom.

DOUBLE FORK AND FEELER COMBINATION.

Perfect cloth must be uniform in character, and free from gaps and blemishes. Absolute perfection is impossible, and various degrees of perfection are accepted in various classes of goods. In recognition of the necessity for better goods for special purposes, different combinations of mechanism to produce proper results are now supplied.

Starting with the most elaborate and complex combination, the feeler, double fork, and feeler thread-cutter, in connection with the parts operating the transfer filling from the hopper is shown in Fig. 2. The feeler thread-cutter is always present with the feeler, but the double fork is not a necessity.

Fig. 1. Northrop Dobby Loom.

The feeler looms are all made so that they will allow the making of goods without mispicks by supplying filling just before exhaustion, stopping the loom for a break in the filling to allow the weaver to match the pick, or they may be set to change the filling when it breaks and run the chance of a mispick at such times. With the mechanism above illustrated, the change for either purpose is possible through the moving of one piece of mechanism. When the feeler is used with the single fork, it might allow a slight thin place when the filling is changed on breakage of filling, so the double fork is used when the goods seem to demand extra care in the preventing of thin places.

It may not be quite clear why an extra thread-cutter is necessary with a feeler mechanism, but on reflection it will be seen that a shuttle which ejects its bobbin before the filling is entirely woven, still carries the thread of that bobbin, and this thread must be cut, or the shuttle

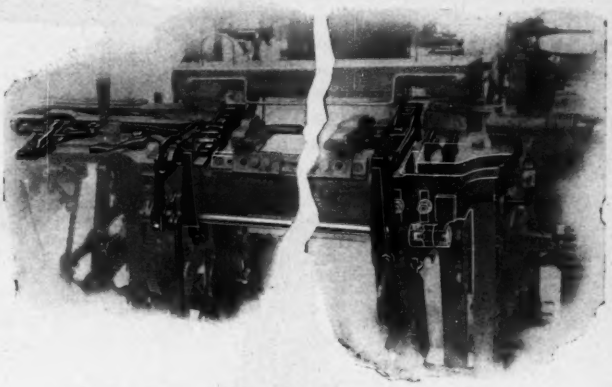


Fig. 2. Double Fork, and Feeler Motion.

may carry this same thread back into the cloth. The temple thread-cutter can not take care of this special thread, since it is not in proper position. Were the temple thread-cutter set to engage this thread, it would also cut the running thread at every other pick. This feeler thread-cutter has been improved by slight modifications which do not show in the illustration, but which do, however, materially add to its efficiency.

The double fork is very commonly used on these looms without the feeler, because the double fork not only affords a double protection against disorder, but it also has a double chance to control the take-up and prevent the slightest crack or thin place. The filling, of course, may break either going from or going to the hopper side of the loom. It may therefore call for a change of filling after having missed filling one shade, one shade and a fraction, two shades, two shades and a fraction, or three full shades. One fork can not possibly detect these variations.

The double fork construction is practically "fool-proof" at present, its only disadvantage being in the requiring of two inches width in the loom to weave the same width in cloth.

The feeler is intended for application with goods where bunches from the ends of the filling are objectionable, but if sufficient care is taken with spinning, it ought not to be a necessity for the average run of fine goods. Feelers are often thought an essential on twills and drills, but the peculiar action of the single fork on three-harness goods puts the new filling into the proper shed the majority of the time; in fact quite as often as is usually accomplished on ordinary looms by average weavers.

To secure the best results from feelers, it is necessary to change the traverse motion on the spinning frame to wind a preliminary short traverse, or "bunch," as it is sometimes called, to thereby limit the amount of waste. The feeler is peculiarly adapted to napped goods, where absence of filling shows very plainly.

STAFFORD AUTOMATIC FANCY LOOM.

This loom, as shown in the accompanying illustration Fig. 1, combines a standard Stafford dobby with the regular automatic shuttle changing loom. The dobby is made for use where fancy goods requiring from eight to twenty-five harnesses are to be produced.

By means of an improved pattern controlling mechanism, the pattern chains of both dobby and box-motion can be moved in unison by the weaver standing at the front of the loom, whenever it is necessary to turn the pattern motion back on account of mispicks or other faults in the pattern being woven.

The Whitin dobby has several features which should be

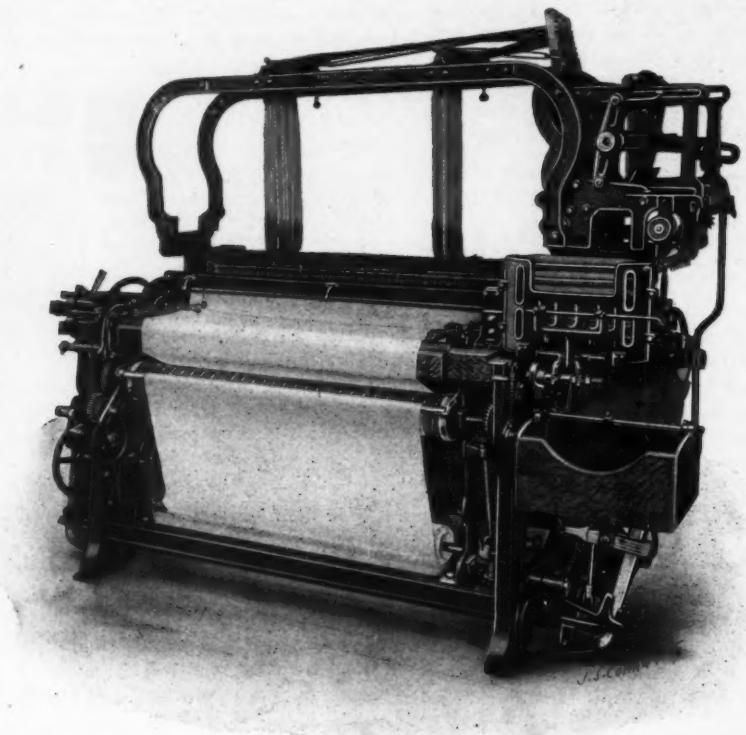


Fig. 1. Stafford Fancy Goods Loom.

On certain lines of fancy goods, when the pick has to be absolutely matched, the feeler motion can be used to advantage. The motion is so arranged that the shuttle changing mechanism is indicated after the yarn has run down to a pre-determined extent. A fresh shuttle is inserted in the loom before the other shuttle has entirely run out. There is, in consequence, a slight waste each time the shuttle is changed, but this has been reduced to a minimum on account of the improved and superior nature of the mechanism. An important feature of the feeler motion is, that no special provision has to be made in the spinning room for building a bunch of yarn on the bobbin for the feeler finger to act upon. The motion is a double-acting one, with two fingers, one connecting with the head of the bobbin, or if cops are used, with a collar on the spindle, and the other feeling upon a spring that comes in contact with the arm through a slot in the shuttle wall. This is a simple and smooth running motion and will give good results even where requirements are unusually exacting.

WHITIN FANCY DOBBY LOOM.

This loom is especially adapted for weaving fancy dress goods. It is fitted with the Crompton box motion of four or six boxes into one and a dobby motion of any number of harnesses from 8 to 30. The accompanying illustration shows a loom fitted with six boxes.

of interest to manufacturers of fancy cotton goods. The sides are of a substantial and pleasing design. They are rigidly connected by cross pieces at the back, and further strengthened by the hook racks bolted between them.

The harness levers, connectors, and hooks are of ordinary construction common to dobbies of the Hattersley model. The connectors and hooks are made of malleable iron, and are therefore light and strong. The hook racks are made so that both the hooks and connectors are readily removed without the necessity of taking the dobby apart.

The knives are usually connected to the rocker arms by wrought iron hooks, but eye-bars with swivel adjustable joints may be used instead. A harness leveling device of a simple and effective nature is also provided. The pattern chain cylinder is driven by a spring-pawl and ratchet. Another arrangement is to have a detachable chain and intermittent worm and gear.

The power to drive the dobby is transmitted by gearing from the crank shaft of the loom. This gearing is so situated that the danger of oil spattering on the warp is entirely avoided.

The Whitin Machine Works build both the single and double index dobbies of 8, 10, 12, 16, 20, 21, 25, 26 and 30 harness capacities, and they may have either upright or horizontal harness levers.

A simple and effective leno motion can be readily applied if desired.

These dobbies can be attached to any of the various patterns of Whitin looms and also to looms of other makers. Twelve harness of 5/8-inch thickness is the capacity of the Whitin Standard pattern loom, and twenty harness for the Ponemah pattern, although sixteen harness in the former and twenty-six in the latter may be used with a little crowding. By using harness frames 7/8-inch thick, the Ponemah pattern loom will accommodate 30 harness. Dobbies with upright harness levers are more generally used in preference to the horizontal lever dobbies. The former is attached to the end of the loom, and the latter to top of loom arch. The double index dobby is more desirable for weaving long patterns, as it requires only half as many bars of chain as would be necessary to weave the same pattern on single index dobby. Beam holders and yarn slackeners for two or more beams may be added for weaving leno work of all kinds of patterns.

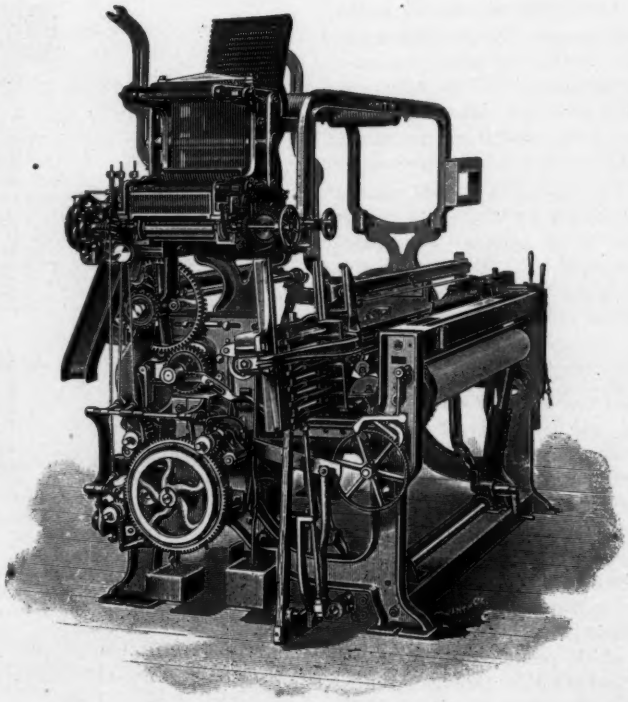
THE K-A ELECTRICAL WARP STOP MOTION.

The essential difference between mechanical and electrical forms of warp stop, that, whereas the mechanical warp stop has a continuously moving "feeler," all the elements of the electrical warp stop are normally stationary, acting only when a warp thread breaks. Again, the mechanical warp stop has mechanism to transmit to the handle shipping devices the reaction of the "feeler" on encountering a fallen drop wire. In the electrical warp stop, the fallen drop wire acts as a switch, closing an electrical circuit, and through electro-magnetic action, causing the handle shipper devices to be operated by some moving loom element.

The K-A electrical warp stop has a wide scope of usefulness as evidenced by its employment with various weaves from sheetings to lawns in cottons, as well as with woolens and worsteds. Its simplicity is such that some mills effect their own applications, only purchasing the equipment.

An electrical warp stop depends for its efficiency principally on its detector device, and the efficiency of this is measured by its simplicity, and its immunity from lint interference, as well as on the regularity, sufficiency, and certainty of its current supply. The characteristic feature of the K-A electrical warp stop is its detector device which differs radically from others. Different makes of stop motions generally comprise drop wires, a guide bar or rod for the same, and a contact element which may be either the moving "feeler" of the mechanical stop motion, or the electric terminal of the electrical motion. The K-A eliminates the separate contact element by embodying it in the guide bar as shown in Fig 1. The guide bar has in its upper edge a metal blade which is electrically insulated from it: the whole is known as the K-A compound electrode, the bar or body being one terminal of the electric circuit, and the blade the other.

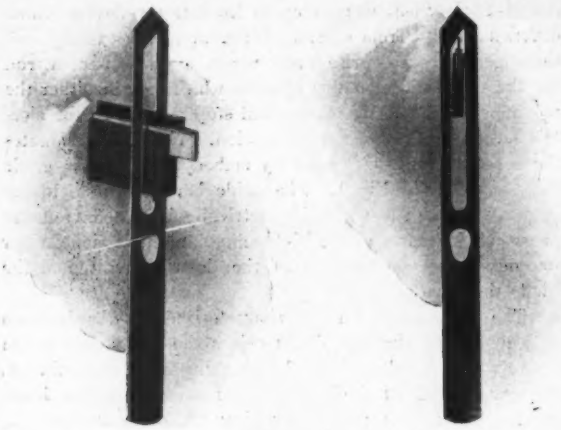
The K-A drop wire is characterized by the inclined upper edge of the slot that receives the electrode. When a drop wire is released by the breaking of a warp thread, engagement of its inclined interior edge with the blade of the electrode causes a wedging action or contact between the blade and body which is peculiarly positive and certain as shown in Fig. 2. Because both terminals of the electric circuit are incorporated in one member, their relation can not be affected by vibration which tends to disturb the contact of the drop wire that connects two separate members. If anything, vibration intensifies the action of the K-A drop wire.



Whitin Dobby Loom.

There can be no lint interference, because the electrode extends above the warp, so that any lint must gravitate away from the contact point. As the electrode extends through the drop wires, the contact point is housed by them and therefore is immune from fly.

The K-A detector device is simple and compact, and in consequence has unusual range of adjustment to meet different weaving conditions. Not only is there no contact device outside of the drop wires, but there is no girt or guard. The only elements that do extend across the loom



Figs. 1 and 2. Wire Suspended and in Contact with Electrode.

are the electrodes and the lease and center rods which support the warp and sustain the drop wires from the electrodes while their threads remain intact. Therefore, the space occupied by the K-A detector device is measured by the distance across the lease rods, by the length of the drop wire and extent of its drop and by the width of the fabric, plus the space occupied by the supporting brackets. These, as indicated in Fig. 3, are simple and compact. The casting that supports the electrodes and lease rods is adjustable to and from the harness, and also vertically, so that the drop wire sytsem can be raised bodily and adjusted to any height.

The lease rods are simply supported in sockets without any securing means. The electrodes are held as in a vise. There are no screws or pins to be inserted or removed. To secure an electrode in position, it is only necessary to insert it in place and tighten a nut, which adequately locks it. To remove the electrode, it is only necessary to loosen the same nut, and withdraw the electrode.

As the contact element (the electrode) is entirely within the drop wires, it has no relation to or effect on the size of drop wire to be employed, and conversely, the length of drop wire has no effect on other parts of the device. With the same arrangement of electrodes, lease rods and brackets, any length of drop wire can be employed, providing the length is not such as to interfere with any part of the loom or its other equipment. The same equipment is used for a 12 grain drop wire as for a 200 grain as shown in Fig. 4. Because of this uniformity of equipment, the parts for the K-A can be made in quantity, by specialized methods of manufacture, which produce the equipment at low cost, practically interchangeable between different types and makes of loom.

The drop wires are usually arranged in two banks or

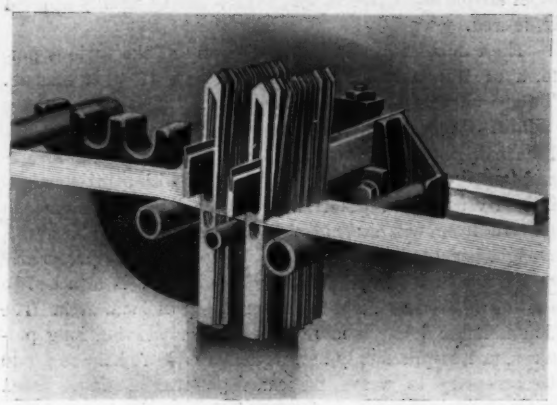


Fig. 3. Sectional View, Showing Drops in Two Banks.

rows, but in cases of high sley they are dispersed to prevent crowding by arranging in three or more rows.

In case a warp thread breaks, its location is ascertained by running the finger over the tops of the drop wires. Those resting on threads that are intact, hang free and yield to the touch, but the drop wire that has fallen, wedges on the electrode and resists the movement of the finger, causing the drop wires to separate and disclose the one which is down.

The usual equipment of drop wires is of the closed type, which are drawn in with the warp, twisted in, or tied in with the Automatic Warp Tying Machine. This form and procedure is preferable where warps are repeated,

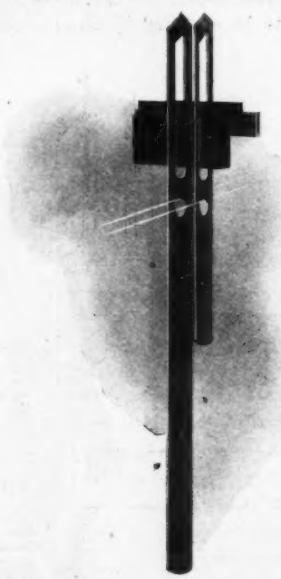


Fig. 4. Different Sizes of Drops on Same Electrode.

because the latter come to the loom with the drop wires all in place ready to run, and the looms do not remain idle awaiting the application of drop wires. Where it is impracticable to draw or tie in the drop wires, those of the open type must be used as shown in Fig. 5.

Where the warp is drawn in either manually or mechanically, or tied in, an advantageous device is the drop wire protector. This is a piece of cloth of a length somewhat greater than the width of the warp, having in its

long edges, bars like curtain sticks. When the drawing or tying in has been completed, this cloth is folded about the under ends of the drop wires, the bars being brought up against the drop wires close to the warp threads and tied together. The drop wires, lying in the fold of the cloth, are prevented from entangling with the warp threads and the latter are thus preserved from breakage in transportation to the loom. Preparatory to such transportation, the

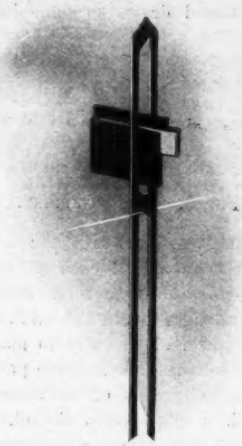


Fig. 5. K-A Open Drop Wire.

drop wires are tied up (with the protector) with the harness and reed to the warp beam.

Much interest centers about the "knock-off," but a detailed description of K-A "knock-offs" would require more space than is here available. There are in present operation many different kinds ranging from the earliest K-A devices where the weft fork apparatus was resorted to, down to special equipment designed to meet special conditions. The usual and preferred form of equipment is that which comprises a dagger that is projected, by electromagnetic action into the path of some moving loom element such as a "bunter" secured to the "lay" or "sword." In older constructions, the dagger encountered the weft hammer. The encounter of the two elements reacts upon the loom handle, releasing it and causing the loom to stop. One form of this equipment is illustrated in Fig. 6, applied to a Whitin loom.

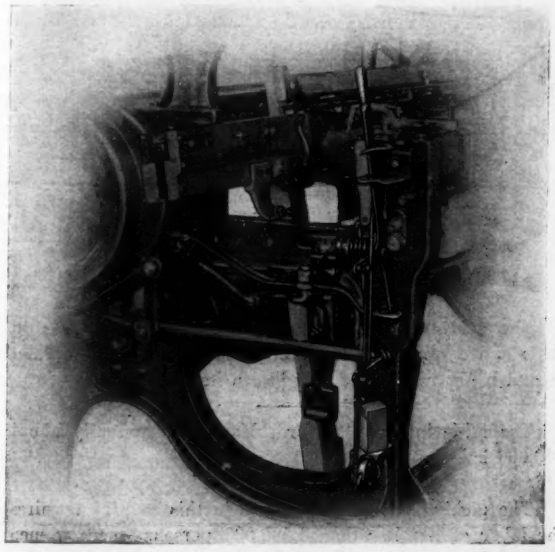


Fig. 6. Mechanism to Operate Shipper Handle.

Figs. 7 and 8. K-A Magnet Box and Automatic Switch.

The K-A magnet is illustrated in Fig. 7 which well indicates its compact proportions, the cut being about half size, as is that of the switch shown in Fig. 8. The function of the latter is to cut off the current from the loom when the latter is stopped, so there may be no short circuit and wastage of current caused by falling of the drop wires into contact with the electrode, in case the warp is slackened. The switch is controlled by the loom handle which automatically operates it to throw the loom into circuit when started, and cut it out when stopped. The switch is so enclosed as to be protected from dirt and tampering.

The generator and wiring are somewhat heavier than is usual for this class of work, and a mistaken idea has gained some credence that this predicates a heavier current than is wise. Such is not the case, however, for the current used by the K-A is as low of voltage as is used by other electrical warp stops operating in like manner under like conditions. It is scientifically designed, thoroughly built, equipped with ring oiling bearings, and in every way suitable for use in a mill. Its ample capacity supplies reserve energy for contingencies, which is desirable.

The wiring has been determined by the same considerations which impelled the selection of the generator, and both are justified by the results. Inadequate conductors cause drop in voltage (which is comparable to loss of water pressure due to inadequate size of pipes), and the effects of drop and leakage are felt more, proportionally, on low voltage circuits than on those of high voltage. Therefore the wiring is laid out carefully and methodically like electric light wiring, the circuits balanced to insure even distribution, and every precaution taken to insure permanence.

TAVELLA SHUTTLELESS LOOM.

This loom, shown in Fig. 1, while having more or less the general appearance of a regular shuttle loom, differs radically from the latter in that no shuttle is necessary for weaving.

Nearly all kinds of woven fabrics can be produced on this loom—from the coarsest rugs and art squares of all designs, to the finer makes of cotton, woolen, and silk. Single pick work in many colors may also be obtained on this loom.

In the weaving of Oriental rugs, this loom can produce ten yards of such goods, while the ordinary make of hand loom is making one yard of rug work. The speed of the

shuttleless loom for this work is about 40 to 50 per minute. It can be operated all day at the same speed, thus making one loom produce as much as ten hand looms. A hand loom requires one weaver for each loom, while one weaver can attend to four or five Tavella looms.

This loom has but one main shaft, on which all needful

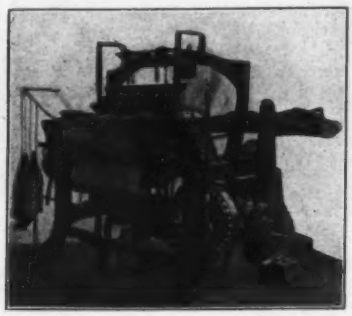


Fig. 1. Tavella Shuttleless Loom.

attachments are placed, by means of which, when the loom is running, each and every part accurately performs its own share of the work in regular order.

Located outside of one of the selvages is a weft presenter or presenters, shown in Fig. 2, which are under the control of a suitable pattern surface. Located outside of the opposite selvage is a weft carrier, shown in Fig. 3. The weft carrier is located directly opposite from the weft presenters.

The weft carrier has combined with it means whereby the same is opened at its outer end after it has been projected through the shed, at which time it grasps a weft thread extending from a weft presenter which is then in its operative position. The filling thread is at this time connected to the selvage from the last pick of that color in the cloth. The weft carrier, having been opened at its end to catch a weft thread, is automatically closed on the weft, and at the same time the cutters of the weft sever it between the carrier and the selvage. The weft carrier is then retracted through the shed, taking with it the single thread of weft which is drawn from its bobbin through the weft presenter.

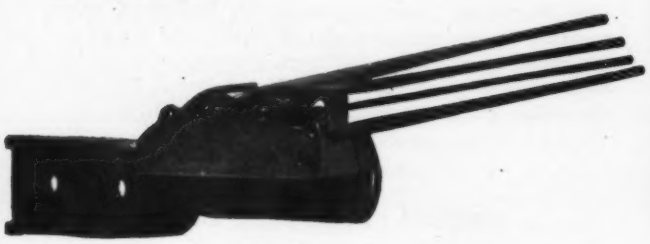


Fig. 2. Weft Presenters.

As the weft carrier completes its backward stroke and is withdrawn fully from the shed, the reed beats the single weft into the fell of the cloth. Immediately after the beating up, the weft carrier is opened to release the free end of the weft.

The weft carrier is actuated forward and backward through the shed by means of an eccentric having a cam groove, the groove receiving a roller on a link connected with a lever pivoted within the loom frame. The upper end of this lever is attached to a portion of the weft carrier. The weft carrier is reciprocated on a track or guideway fixed with relation to the loom side rather than on a track forming part of the lay.

The harnesses are operated to form the shed by means of cams. In the operation of the loom, about one-fourth of the cycle is taken up in the movement of the harness and of the reed, and the other three-fourths in actuating the weft carrier forward and backward. This length of time is necessary for the weft carrier to pass through the shed, seize a weft and draw the same back through the

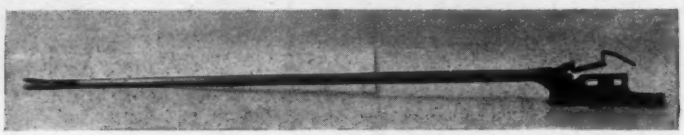


Fig. 3. Weft Carrier.

shed. In preparing the warp for the loom, three warp threads extra on the outside of each selvage are provided. The weft weaves in with these threads, but they are removed from the selvages while the cloth is being woven by means of disc cutters. In order to make a strong selvage and bind the weft threads at these points to the warp, the four outer warp threads of each selvage are woven in connection with a doup warp thread.

The bobbins of weft are conveniently located below the weft presenters as shown in Fig. 1. A comparison of the sizes of these bobbins with the regular shuttle bobbin is shown in Fig. 4. These large bobbins hold sufficient weft to run the loom throughout the day.

The speed of the loom for fancy colored weaving is 120 picks per minute.

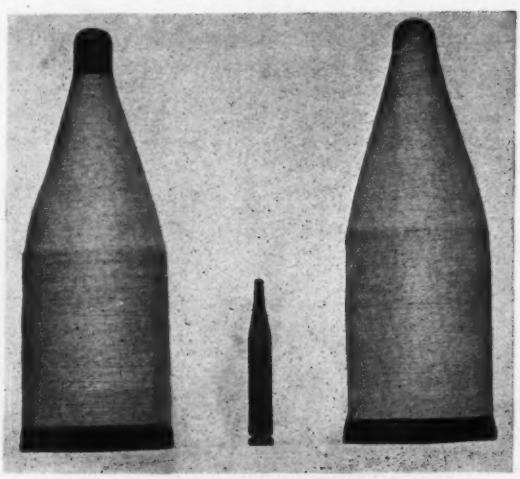


Fig. 4. Bobbins for Tavella Loom.

New Bedford, Mass., ranks first in the United States in the manufacture of fine cotton goods and fine yarns; and second in the number of spindles in its cotton mills.

The mills in New Bedford, Mass., use annually about 240,000 bales of cotton.

The picking of the cotton crop in this country requires the labor of not less than 1,500,000 persons—men, women and children, working constantly every day for four months.

National Association of Cotton Manufacturers

On September 22nd and 23rd, the 87th semi-annual meeting of the National Association of Cotton Manufacturers was held at the Mt. Washington, Bretton Woods, N. H., with over 200 members and guests in attendance.

President Plunkett held an informal reception on the evening of the 21st, receiving the members and guests, after which there was a promenade and concert followed by dancing. There were four sessions of the convention during the two days with golf tournaments in the afternoons.

The business sessions were as follows:

The first session was held on Wednesday, September 22, 1909, at 9 a. m. Call to order. Business. Welcome to the Granite State, His Excellency, Henry B. Quimby, governor of New Hampshire. Responses to the address of welcome, Edwin Farnham Greene, Boston, Mass. President's address, Charles T. Plunkett, Adams, Mass. The following papers were then read: "The Legal Relations Existing Between Mill and Selling Agent," Walter S. Newhouse, New York City; "Third Report of Committee on Standard Specifications for Staple Gray Goods," Albert Farwell Bemis, chairman; Frederick A. Flather, secretary; Daniel Moore Bates, S. Parker Bremer, John Eccles, Edwin Farnham Greene, Alfred M. Goodale, George H. Hills, James R. MacColl, Frederick B. Macy, and Lewis G. Parker.

The remaining sessions were devoted to the reading of papers as follows: Second session held Wednesday, September 22, 1909, at 8.15 p. m. "Limitation of American Cotton Production Affected by the Scarcity of Labor in the South," illustrated by moving pictures, by Theodore H. Price, New York City. "Increasing the Earning Capacity of a Plant," Henry D. Martin, Clinton, Mass.; "Physical and Mechanical Improvements in Sizing Methods," Leonard W. Cronkhite, Boston, Mass.; "Sizing," J. W. Lindau, 26 Broadway, New York City.

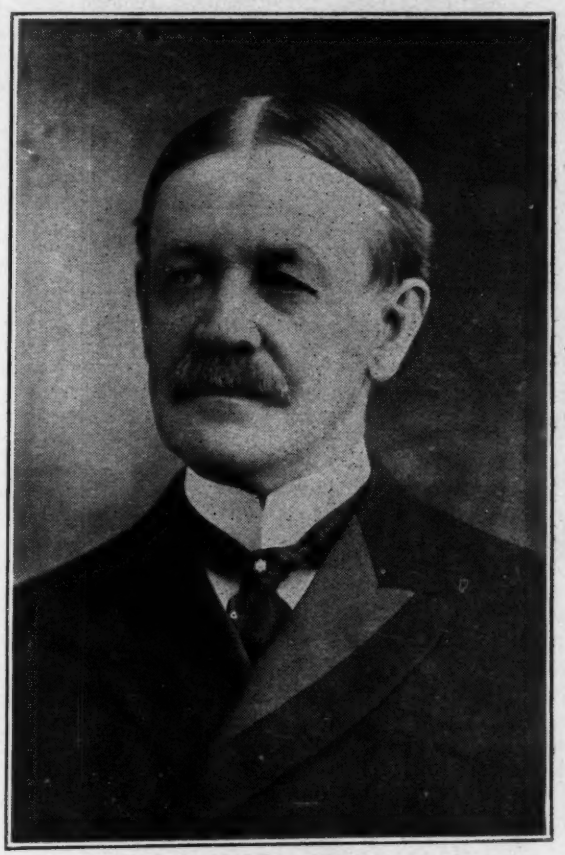
Third session held Thursday, September 23, 1909, at 9 a. m. "Accidents to Cotton Mill Operatives," Edward W. Thomas, Baltimore, Md.; "Housing Mill Employees—the Intensive Use of Land," George H. Miller, Boston, Mass.; "Sanitary Conditions in Ventilating and Humidifying Mills," George V. S. Michaels, New York City; Secondary Textile Education," William H. Dooley, Lawrence, Mass.

Fourth session held Thursday, September 23, 1909, at 8:15 p. m. "Reinforced Concrete for Textile Mill Construction," J. P. H. Perry, New York City; "Pneumatic Service for Cleaning Textile Machinery," Albert W. Thompson, Manchester, N. H.; "Cork Inserts as Applied to Textile Machinery," Lawrence Whitcomb, Boston, Mass.

NEW MEMBERS ELECTED.

The following were elected to active membership: John Schofield Boyd, John S. Boyd Co., Williamstown, Mass.; William B. Gardner, Treas., Nashavena Mills, New Bedford, Mass.; E. Payson Gibbs, Supt., Langdon Mfg. Co., Stuyvesant Falls, N. Y.; Nathan Hatch, Vice-Pres. and Mgr. Fuld & Hatch Knitting Co., Albany, N. Y.; George C. Hinckley, Vice-Pres. and Treas. Tilton Mills, Valley Falls, R. I.; Kenneth J. Merrill, Agt. Tilton Mills, Valley Falls, R. I., Pawtucket, R. I.; Joseph K. Milliken, Treas., Mt. Hope Finishing Co., North Dighton, Mass.; John B. Perkins, Treas., Textile Specialties Co., Boston, Mass.; Charles W. Prary, Supt., Holmes Mfg. Co., New Bedford, Mass.; Walter H. Undertown, Treas., New Bedford (Mass.) Cotton Mills Corporation; and William E. Kerr, Treas., Taber Mills, New Bedford, Mass.

Those elected to associate membership were: Henry Fisher, National Ring Traveler Co., Providence, R. I.; Harold C. Hansen, Vice-Pres. and Treas., Draper-Hensen Co., New York City; William O. Howland, J. W. Quinham Co., Lonsdale, R. I;. Walter S. Newhouse, counsellor-at-law on textiles, New York City; F. Nathaniel Perkins, Boston, Mass.; Theodore R. Plunkett, Standard Mill Supply Co., Adams, Mass.; Christopher J. Shambow, Shambow Shuttle Co., Woonsocket, R. I.; and Charles P. Slocum Corn Products Refining Co., Boston, Mass.



GOVERNOR HENRY B. QUIMBY.

President Charles C. Plunkett addressed the meeting in part as follows:

PRESIDENT'S ADDRESS.

Among historical repetitions, none are better known than those associated with textile trade conditions. From earliest records the natural law of supply and demand worked as effectively and constantly as in the present day. The single spindle of ancient spinning wheels, with its complement of hand card and loom, has certainly brought its owner to realize the inexorable law as now compels

GROUP OF DELEGATES AND GUESTS, NATIONAL ASSOCIATION OF COTTON MANUFACTURERS.

97 per cent. of European spinners to suspend for months the production of two days per week, which is equivalent in spindleage to that of the entire American mill ownership in full operation.

So disastrous has been the overbuilding in Lancashire during the past three years, that meetings are now being held to discourage the promotion, by speculators and illy informed capitalists, of further undertakings in cotton manufacturing.

It is significant that practically all of the workers' unions are actively engaged in this movement, and are revealing sagacious leadership which faithfully foresees, and endeavors to forestall, the deplorable results of the long continued idleness of 70,000,000 spindles during one-third of each week; affecting substantially every cotton mill operative in Europe and Asia. Incidental to the curtailment of output of goods, but of almost equal importance, through its world-wide application to cotton manufacturing, is the influence upon the cotton market. The co-incidence of a prospectively undersized American crop, albeit there are supposedly large holdings of old cotton, and the controlled requirements of spinners abroad, provides an occasion for universal speculation. Uncertainty as to quantity and quality of staple will elicit highly illuminated forewords, and trade reports will be put under the giant press to extract the essence of genuine market knowledge, so requisite to balance the scales when they are temporarily tilted by eloquently plausible outgivings of bulls and bears, in and out of the exchanges. It is unquestionably true that full consumption of cotton at this time or in the near future, would result in an enhancement of cost to prohibitive figures, and speedily bring the termination of what promised to be an extended period of prosperity in cotton manufacturing and kindred industries.

In making brief mention of manufacturing conditions as remotely and recently noted in European mills, I wish to wholly disclaim pretensions to extraordinary information or knowledge, and observations must be understood to apply in a general sense, and not to exceptional mills in either Europe or America.

The American does well to perfect his information as to what his contemporaries are accomplishing in this country, and, out of his wisdom, surpass them if he can; but the assumption that American standards or ideals, at least in industrial activities, are supreme is an act of exaltation and egotism quite sufficient to protect our foreign competitors for ages yet to come.

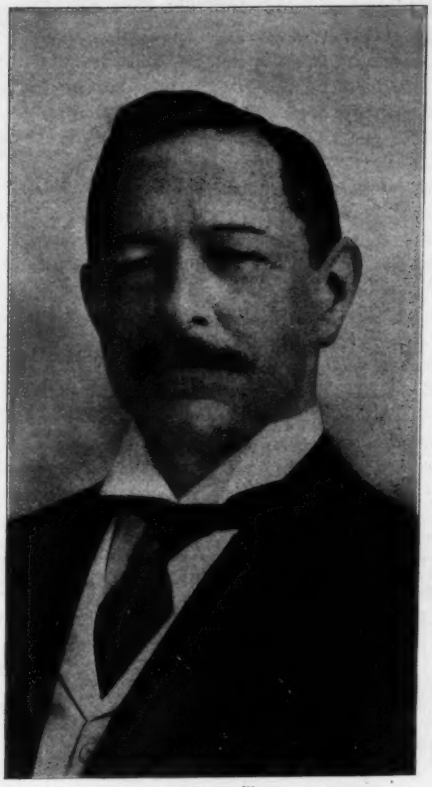
We are not likely to over-estimate the innate mercantile discernment, mechanical genius and sober judgment of Anglo-Saxons and Teutons, which, be assured, has not suffered deterioration during the present generation. No Yankee nor Southron could have more clearly perceived nor more promptly appropriated progressive ideals than have our European and perhaps our Japanese rivals.

In management, the observable frugality in reclamation of usable waste fibers is most striking and calls for more intensive supervision if in this particular we would equal the savings (which are earnings) made by foreign mill officials.

Again, to their credit it must be said, that finer discrimination is made in selection of staples and grades of cotton—a buyers' characteristic rapidly spreading here, where expertness and prudence in this vocation should be unsurpassed.

In making appropriations for the department of agri-

culture for the year ending June 30, 1909, the act authorized the secretary of agriculture "to establish a standard for the different grades of cotton, calling to his assistance for that purpose expert cotton classifiers, by fixing a standard of middling cotton and using the same as a basis, establishing a standard of nine different grades to be designated middling fair, strict good middling, good middling, strict middling, middling, strict low middling,



PRESIDENT CHARLES T. PLUNKETT.

low middling, strict good ordinary and good ordinary." The secretary was further authorized "to prepare in practical form the standard of said grades and furnish the same upon request to any persons, the cost thereof to be paid, when delivered, by the person requesting the same, and certified under the signature of the said secretary and the seal of his department."

Carrying out the provisions of the act, the secretary of agriculture convened in Washington in February a committee of cotton experts, including, Messrs. Nathaniel Thayer and Lewis W. Parker as representatives of this Association, the former being chairman. The committee, after due deliberation, submitted a unanimous report, which the secretary has approved, fixing the grades and making certain recommendations in connection therewith. In view of the fact that contracts are made for cotton in advance of the ensuing cotton season, the committee recommended that the grades agreed upon by the committee be not promulgated for general use in trade transactions prior to September 1, 1910. The grades are to be put up in a very attractive and substantial manner. The boxes will be 21 inches square and 4½ inches deep, inside measurements, made of the heaviest grade of binders board, and covered with black cloth. The hinges will consist of two thicknesses of linen glued on. Inside the cover of each box there will be a full size photographic reproduction of the cotton types contained therein, as they appear when they leave the department of agriculture, each grade being accompanied by a certificate as to the type of cotton represented under the seal of the secretary. Nine such grades will comprise a set, each grade being represented by 12 types.

In this meeting's programme, there are papers and reports on subjects which have ordinarily found place in the addresses of presidents, and it is an indication of progress that such competent writers and committees will contribute their services and superior talents. I assure you that they are appreciated by your present executive who will not encroach upon their time nor province, but congratulates you that the presentation of matters of large importance will be made by persons who are admirably qualified by experience and practical education.

COMMITTEE ON STANDARD SPECIFICATIONS FOR STAPLE GRAY GOODS. (Third Report.)

To the president of The National Association of Cotton Manufacturers:

The result of your committee's work and its recommendations, approved and adopted by this Association last April, were, one month later, approved by the American Cotton Manufacturers' Association at its annual meeting held in Richmond, Va.

Since its second report, made at the annual meeting in Boston last April, your committee has made such modifications in the form and details of its proposed Sale Note and "Allowable Variations," as have been found desirable for practical use. The committee has also devoted considerable time to fostering the adoption of the Sale Note by the trade.

In June, a meeting was held in New York City between representatives of leading New York brokers and commission agents, and members of the Uniform Contract Committee of the American Cotton Manufacturers' Association, and this committee. No individual working alone could expect to satisfactorily cope with the problem. It seems to your committee that the proposed Sale Note, with its simple and equitable legal conditions and "Allowable Variations," should gradually be adopted by the trade, or at least become the basis of operations in this country.

As the principal part of this report, we attached hereto a copy of a proposed form of Sale Note, as finally revised and amended by your committee, which has been submitted to the Board of Government for its endorsement, in accordance with the vote of this Association passed at the annual meeting last April. Whereas this particular form is made out for use by a broker, your committee again calls attention to the fact that, with a change of a word or two, it is equally adapted for use by others. This Sale Note form your committee is disposed to submit at its final report.

Attention should be called here to the action taken by the American Cotton Manufacturers' Association in May, when adopting the report of its committee on a uniform contract for gray cloth, in appointing a committee to study and propose similar regulations for use in the cotton yarn trade. The necessity for some such standard was clearly brought out by the discussion at that time, indicating for instance, a considerable difference of opinion as to the weight limits within which yarn should come. Your committee suggests the appointment of a committee to consider

the subject, feeling sure that no harm, and possibly great good, to the cotton yarn trade of this country would result from the study and standardization of yarn variations and contracts.

The Cotton Manufacturers' Uniform Sale Note is now in actual use in the trade, transactions having been made with it, and the extent of its use will rapidly increase.

CONTRACT SALE NOTE.

Form approved and adopted by The National Association of Cotton Manufacturers and American Cotton Manufacturers' Association, 1909.

Number

SOLD FOR ACCOUNT OF

TO

QUANTITY yards (variation not to exceed two per cent. allowed)
pieces of yards each
bales of yards each

In addition, buyer to take } % Seconds @
and seller to deliver if made: } % Tailings at stated contract price if contract is not renewed.

QUALITY

TIME OF DELIVERY from date hereof
during each week, commencing week ending
during each month, beginning in the month of
(Delivery within two days before or after times specified above is allowed)

COUNT PER INCH, Warp Filling

WEIGHT YARDS TO THE POUND.

WIDTH IN INCHES

PRICE CENTS PER YARD

TERMS OF PAYMENT:
Net days from date of delivery.
Net days from date of delivery less % for payment within days from date of delivery.

PLACE OF DELIVERY:
F. O. B. to carrier at with freight allowance.
F. O. B.

SPECIAL CONDITIONS:

SHIPPING INSTRUCTIONS:

If the production of the seller shall be curtailed during the time above named, by strikes, lockouts, or unavoidable casualties, the deliveries shall be made and accepted in proportion to the production.

The provisions of paragraphs I, II and III, and the allowable variations from specifications as adopted by The American Cotton Manufacturers' Association and The National Association of Cotton Manufacturers, all as printed on the back hereof, are accepted and agreed to as a part of this contract, unless otherwise stated herein.

This sale note is the entire contract between the buyer and seller, and any alteration in or changes from the printed form of this contract must appear on it in writing.

To

Broker.

[Over]

Paragraph I.—PASSING OF TITLE ON DELIVERY. Unless otherwise specified, the title to goods sold passes to the buyer (subject to the right of stoppage in transitu):—

a. Upon delivery F. O. B. to carrier, consigned to buyer, and thereafter goods are at buyer's risk.
b. Upon arrival of goods at destination and delivery to buyer of bill of lading or of goods, in the case of goods to be delivered F. O. B. elsewhere than to carrier.
c. Upon delivery of indorsed bill of lading or of goods, in the case of goods consigned to seller's order.
d. Upon the separation of the goods and holding subject to buyer's order (the invoice to follow by due course of mail), in the case of goods to be held or if buyer fails to give shipping instructions.

Paragraph II.—FREE STORAGE. Sixty days' free storage allowed on goods invoiced and held, the same to be at buyer's risk but to be covered by fire insurance effected by seller in reputable companies.

Paragraph III.—REJECTIONS AND CLAIMS. The buyer can not reject the goods for delay in delivery unless he notifies the seller within two business days from receipt of bill of lading, or of invoice if goods are to be held. When contract calls for delivery in instalments, the buyer can not cancel the contract for any default in any one or more instalments not amounting to a substantial breach of contract.

Buyer can not reject goods for defects in quality or other like defaults (a) if he cuts or converts them, nor (b) unless he notifies seller within thirty days from receipt by him or at finishing works of goods not held, or within thirty days after expiration of period of free storage if goods are invoiced and held; nor (c) unless such defects amount to a substantial breach of contract.

Loss of right to reject does not deprive the buyer of his right to claim damages, if any; but no recovery shall be had on any claim not made within one year from receipt of goods or beginning of period of free storage.

ALLOWABLE VARIATIONS FROM CONTRACT SPECIFICATIONS.

WIDTH. The width shall not vary anywhere by more than ⅝ of an inch below the stipulated width, nor more than ⅝ of an inch above. The width shall not be uniformly less than the stipulated width, but must, at least in some places in each piece, be equal to, or greater than, the stipulated width. Goods shall be measured at right angles to the selvages when laid open on a flat, horizontal surface and smoothed out by hand, but not stretched.

WARP COUNT. Except within four inches of each selvage, (where the count must approximate that stipulated) the number of warp threads per inch shall not vary anywhere by more than one thread per inch below the stipulated count, nor by more than two threads per inch above. The number of threads per inch shall not run below the stipulated count throughout the piece, but must at least in some places in each piece, be equal to, or more than the stipulated count.

FILLING COUNT. The number of threads in the filling, or weft, shall not vary anywhere by more than three threads per inch below the stipulated count, nor by more than four above. In the case of sateens, however, when the count of filling exceeds the count of the warp, the allowance for variation above specified shall be increased by the same percentage that the filling count exceeds that of the warp count. In any case the filling count per inch shall not run below the stipulated count throughout the piece, but must, at least in some places in each piece, equal, or be more than, the stipulated count.

WEIGHT. Goods shall not vary from the stipulated weight on either side by more than 4 per cent. in any one piece, or 2 per cent. in the average of any bale or roll. In case of controversy regarding the weight of goods, decision shall be based on goods which have been exposed for twenty-four hours to normal atmospheric conditions approximating a temperature of 70 degrees F. and a humidity of 70 per cent.

The word piece, as used above, refers to a length of about 50 yards.

LIMITATION OF AMERICAN COTTON PRODUCTION AFFECTED BY THE SCARCITY OF LABOR IN THE SOUTH.

BY THEODORE H. PRICE.

I am here to announce that within a few years there will be no longer any limitation upon American cotton production. I must ask your attention for a few moments to a brief statement of why the limitations now existing make the invention of a cotton picking machine one of the most important achievements of human ingenuity.

James L. Watkins in his history of "King Cotton" says that "Fourteen years after the settlement of the Jamestown Colony (1621), cotton was planted at Newport News, Va. In the Carolinas the cultivation of it began in 1666, and in 1748, it began to be exported in small quantities from South Carolina." It was not, however, until 1793 that Whitney made his famous invention of the gin, and it was some years thereafter that the possibilities of cotton as a basis of textile manufacture became apparent. Even then, the progress was slow.

In 1800, the cotton crop of the United States was 155,000 bales. In 1808-09, just a century ago, the cotton crop of the United States was estimated at 177,000 bales. In 1859-60 slave-labor had made it possible to raise a crop of 4,861,000 bales, the increase in the fifty-one years being 2,748 per cent. The crop of 1908-09 is approximately 13,851,000 bales, the increase in the last forty-nine years being about 285 per cent. In other words, dividing the last century of cotton production into two approximately equal periods, the first half century being a period of negro slavery in the South, and the second half century that of negro freedom, we find that the increase in production during the time of slavery was nearly ten times as great as that shown after the slaves were emancipated.

When we come to consider the later record of cotton production in America, we find that the ratio of increase in the cotton production of the Southern States is a continuously decreasing one. In 1894-5 the South first produced a crop of 10,000,000 bales (actually 9,901,000). In 1903-4, nine years later, its yield was no larger. In 1897-8, there was produced for the first time a crop of about 11,250,000 bales, and in 1905-6, eight years later, the yield was about the same; being 11,346,000 bales.

There are few who appreciate how far the cost of labor enters into the cost of cotton. Of the cash proceeds of the crop in an average year, I think that fully 75 per cent. is paid in cash to the manual labor which has produced the crop. Exact figures upon this subject are not obtainable, as the statistics of various planters differ radically, but the figures I have named are well within, rather than over, the fact, and there is but little doubt that the labor cost of cotton production in the South at present is substantially in excess of eight cents a pound. Of this total of labor cost, the most important item is the cost of picking.

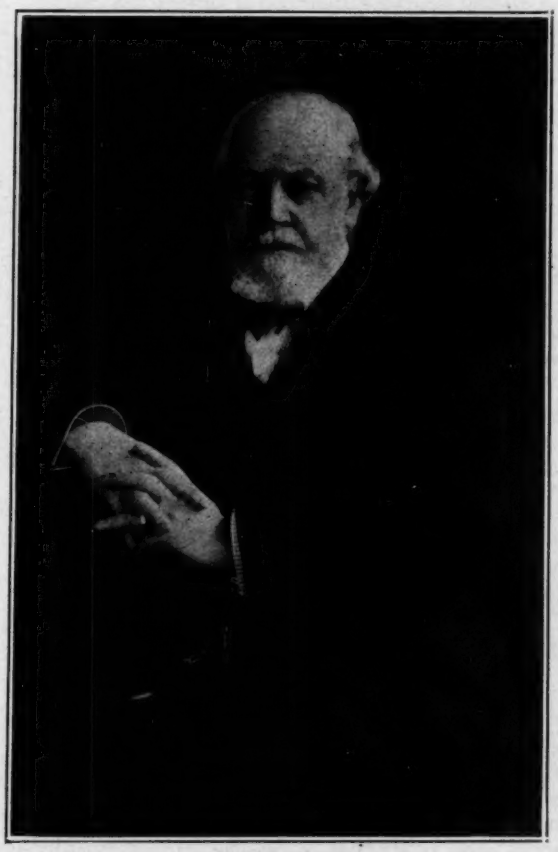
Taking the cotton belt as a whole, I think that the average cost of picking the crop at present may be estimated to be $1 per hundred pounds, or one cent a pound. The weight thus paid for includes the seed, and as a general rule it takes three pounds of seed cotton to make one pound of lint cotton. If the cost of picking be $1 per one hundred pounds of seed cotton, it is equal to $3 per hundred pounds of lint cotton. This is the equivalent of about $15 a bale, and upon a crop of 14,000,000 bales represents the stupendous sum of $210,000,000 in cash which is annually paid for picking the American cotton crop.

The tremendous economic value of any machine which would eliminate, even in a small degree, this enormous item of labor has long been recognized, and for nearly one hundred years or more inventors have been attacking the problem. There are on file in the Patent Office at Washington records of something over 450 mechanical cotton-picking inventions. While cotton is planted in rows as corn is, its lateral development is very luxuriant. It ripens progressively, and its full fruition covers a period of from three to four months. The lower bolls, which develop first, ripen first, and the top bolls, which develop last, ripen last.

It is an annual plant, but its growth seems to cover very nearly the full period of twelve months, and I have known cotton that commenced to bloom in July to continue to bloom, to put on squares and to open its bolls, until well into January. A machine to pick it successfully must therefore be a machine that is automatic in its selection of the ripened cotton, and one that in picking the ripened cotton that protrudes from the bolls will not injure the plant or its leaves. Furthermore, it must leave undisturbed the half-opened bolls, and unbruised and unbroken the blooms or the bolls that have not commenced to open.

WILLIAM W. WHITCOMB.

There appears on the next page in this issue a paper bearing on the use of Cork Inserts in pulleys, looms, mule



William W. Whitcomb.

frictions, and in other frictional devices used in the textile industry. We are pleased to be able to reproduce a photograph of William W. Whitcomb, to whom the original so-called Cork Insert patents were granted, and who is the president of the National Brake & Clutch Co., now owning these patents.

Mr. Whitcomb's early life in the mills and subsequently as assistant agent in woolen mills in Vermont, and for more than fifty years in the wholesale and manufacturing business at Boston, has led him to appreciate existing necessities and to apply Cork Inserts to many uses in cotton and woolen mills, with the result that this simple and inexpensive equipment has given so great satisfaction that these Inserts are now being quite generally adopted throughout the New England and Middle States and to a certain extent in the Southern States. Progressive textile manufacturers will find especially interesting information in the treatise on Cork Inserts, which is the first complete article on the subject that we are aware of.

CORK INSERTS AS APPLIED TO TEXTILE MACHINERY.

What Cork Inserts Are. How Used. Use in the Textile Industry. Cork Insert Tests. Use on Mules. Loom Frictions. Tests on Loom Clutches. Slasher and Calender Friction.

BY LAWRENCE WHITCOMB.

An economical, efficient and almost indestructible means of eliminating losses in power transmission, applicable to nearly every type of friction device used in this great industry, is a matter of interest to mill owners, agents, superintendents, and others in charge of such works. Leading engineers have repeatedly made the statement in engineering publications that the amount of power lost between its source and the point of delivery, through the slipping of belts and other friction devices, amounts to more than is usually supposed, in some cases running as high as thirty per cent. A reliable and economical method of preventing this loss will unquestionably be of great value.

In old mills, where changes and additions have been made from time to time, such loss of power is particularly noticeable. An equipment that can be supplied in one's own machine shop on holidays or out of working hours, and at small expense, has great advantages.

WHAT CORK INSERTS ARE.

Cork is the bark of a tree, known as the cork tree, and is the lightest known solid. It has a very high co-efficient of friction and is not effected by many of the conditions which seriously impair the efficiency of other substances when used for friction surfaces. It possesses a quality not found in any other solid; namely, that of altering its volume to a marked degree under pressure, being compressible and elastic.

Cork is made up principally of an aggregation of minute air cells, having thin, air-tight, water-tight, and very strong walls. If compressed, the resistance to compression continually grows stronger, in a manner more like the resistance of a gas under compression than that of an elastic solid, such as a spring. The elasticity of cork is not only great, but is very persistent. The better grades of corks, such as are used in bottling, expand immediately when withdrawn from the necks of bottles, and show an increase in volume of about seventy-five per cent. even after having been confined under compression for many years.

It is the elasticity of cork, coupled with its high coefficient of friction and its remarkable ability to withstand heat and wear, which make it a valuable material for frictional purposes when used under compression as an insert; but it is a peculiarity of cork that while having much elasticity and strength when confined under pressure, it is brittle when not so compressed; and the very grade of cork that proves to be most indestructible when used under compression as inserts wholly fails, owing to its brittleness and other peculiarities, if used for frictional purposes in its normally expanded and thus weakened condition. It is this fact that has made its successful use for frictional purposes impracticable until the present method of using it under compression was devised.

To obtain this desired compression, sockets are drilled or cast in the face of a pulley, clutch or brake to be thus equipped, and into these sockets are forced corks of a certain grade and of much larger diameter than the sockets themselves. The corks are allowed to dry and are then trimmed and finished so as to have the right amount of projection above the surface of the pulley, clutch or brake.

The amount of this projection depends on the nature of the work required of the friction surface. There are, however, two distinct methods of construction which I particularly desire to call to your attention because the greatest success in the application of Cork Inserts to any device is obtained by using them under right conditions and according to approved methods.

HOW USED.

Let us consider first the so-called All Cork contact. In this method of construction the sockets are so spaced that the corks occupy a relatively large area, and the corks are allowed to protrude above the surrounding surface one-sixteenth of an inch or more, so that they alone come in contact with the opposing surface and transmit all the

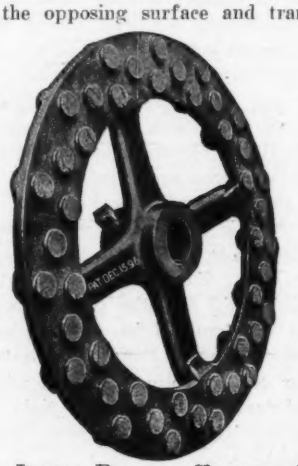


Fig. 1. Cork Insert Friction Used by Crompton & Knowles Loom Works.

power. This drive is most efficient and satisfactory where power is transmitted by means of a large area of cork used at light pressure, as is customary on the frictions of looms and similar machinery, and in certain types of plate and multiple disc automobile clutches. In this service the pressure and the power per square inch of cork are so small that there is practically no wear upon the corks, and hun-

dreds of looms thus fitted have been in constant operation for about eight years without requiring either repairs, cleaning or adjustment.

Cork Insert frictions are particularly well adapted for this purpose, and many thousands of looms are now so driven. One of the largest builders of looms has recently adopted this type of friction for practically its entire output of friction-driven looms, amounting to many thousands every year. The value of the device for this purpose is further demonstrated by duplicate orders received from mills which have been using these frictions, and now invariably specify Cork Insert frictions on new looms ordered by them.

Second, the so-called composite construction. In this method of construction the corks are allowed to protrude above the surface of the material in which they are embedded but one-thirty-second of an inch as in the case of pulleys, mule, slasher, and calender frictions, automobile clutches, street railway brake shoes, etc. This method gives an almost indestructible composite or combination surface of high frictional efficiency and having great wearing qualities. At low and medium pressures, the corks, with a coefficient of friction of say .35, work alone. At high pressures the inserts are compressed into their sockets, and the surrounding metal, wood, or fiber also comes into engagement to supplement and protect the corks. Under these conditions the tendency of the cork to yield to compression is greater than its tendency to wear, and when the pressure applied overcomes the rigidity of the cork the inserts are pressed into their sockets practically flush with the face of the pulley or other friction surface in which they are set. They do not lose any of their efficiency, up to their full frictional limit, since they remain in contact with the opposing surface, and present the same face area as before they were compressed. This tendency of cork to submit to compression and thus protect itself from wear is undoubtedly the reason for the excellent wearing qualities of combination surfaces in which the corks occupy a sufficient proportion of the frictional surface to render efficiently the service for which they are installed.

Two important facts to be remembered are that it is the compression of the cork in the sockets which causes them to protrude again above the metal, wood, or fiber surface in which they are embedded, whenever the opposing surface is released, and that the natural physical properties of this material are such that rapid wear is almost impossible.

That Cork Inserts used under the so-called All Cork contact construction have these remarkable wearing qualities, if properly proportioned in area to the load to be carried, can be readily demonstrated. That Cork Inserts used under the so-called Composite construction will withstand heaviest loads, constant abuse and excessive heat, is shown by their present use in more than 30,000 motor car clutches, and by the adoption of this construction by more than sixty automobile manufacturers who, according to existing contracts, will use Cork Inserts in more than 60,000 new cars in the year 1910.

USE IN THE TEXTILE INDUSTRY.

Having treated the matter rather generally, let us now consider how Cork Inserts are applicable to the textile industry.

Practically all the power in the textile plant is transmitted by means of pulleys driven by belts, and I believe it is generally acknowledged that the capacity of a belt of given dimensions is greater than the capacity of the pulleys over which the belt runs; therefore, pulleys having high frictional efficiency are most desirable.

The loss that occurs from the slipping of belts reaches back to the coal pile. The necessity of speeding up an engine ten per cent. or more, owing to the slipping of belts because of the added load of new machinery, or to keep looms, spinning, and twisting frames or other equipment up to the required speed, means definite waste. On the other hand, the failure of certain machines to operate at the desired speed means loss and in some cases a defective product.

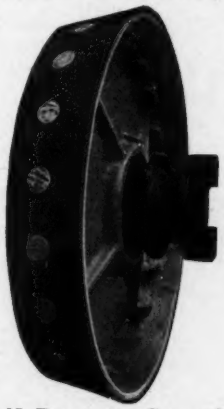


FIG. 2. THE G. N. PIERCE CO. GREAT ARROW CLUTCH.

To eliminate these difficulties, pulleys are lagged and relagged, belt dressing is purchased, sometimes in large quantities and to an extent that means an appreciable yearly charge to expense account; and belts are run under excessive tension, to the injury of the belt and with an increase in journal friction far beyond economical operating conditions. If Cork Inserts are used, such lagging, belt dressing, and excessive belt tension are unnecessary.

Pulleys and friction clutches, from the smallest size to the largest, thus equipped have a friction surface with a high coefficient of friction, long life, and uniformity of action under all conditions of temperature, oil, moisture, etc., features in which they excel all others as may be readily ascertained by the reports of engineers and from technical data available, by enquiries made of parties now using this equipment or, better still, by a direct demonstration in your own mill under your own observation.

CORK INSERT TESTS.

That the Cork Insert pulley exceeds all others in efficiency is shown by tests made by Prof. C. M. Allen, M. S. at the Worcester Polytechnic Institute, a full report of which is too voluminous for this paper but from which report we copy the following:

The object of these tests is to compare the relative power-transmitting properties of the various standard pulleys with those of iron and wood pulleys fitted with Cork Inserts. The standard pulleys used were the smooth iron-face pulley and the ordinary wood pulley.

All of the pulleys were new to start with, but were in prime running condition when the principal tests were made. The belt used was leather, and was kept in good running condition during the tests. The belt speed was about one thousand feet per minute; the revolution per minute of tested pulley was about two hundred.

The conditions of atmosphere were such as to give a

good variety of tests, being made during the months of July and August.

RESULTS OF TESTS.

Load on Dynamometer.	Per Cent. Slip. Iron with Cork Inserts.	Iron.
105.0	0.00	1.30
115.0	0.10	1.37
125.0	0.18	1.44
135.0	0.28	1.51
145.0	0.36	1.56
155.0	0.47	1.65
165.0	0.56	1.72
175.0	0.65	1.79
185.0	0.74	1.86
195.0	0.83	1.93
205.0	0.92	2.00
215.0	1.01	2.06
225.0	1.12	2.13
235.0	1.19	2.20
245.0	1.28	2.26
255.0	1.37	2.33
265.0	1.46	2.40
275.0	1.55	2.50
285.0	1.64	2.60
295.0	1.75	2.73
305.0	1.86	2.88
315.0	2.00	3.03
325.0	2.18	3.18

From the average results of over one hundred tests, the iron pulley with Cork Inserts at a point of 2 per cent. slip (which is considered allowable in commercial practice) shows an increase in its power-transmitting capacity of 51 per cent. over the plain iron pulley.

Respectfully submitted,

(Signed) C. M. Allen.

Subsequent to the above reported test, it was deemed advisable to make a test of the relative efficiency of several types of small, high speed motor pulleys, and again tests were made by Prof. Allen. The pulleys were all five inches

Fig. 3. Cork Insert Wood Rim Driving Pulley.

in diameter with three inch face, and were (1) Cast Iron; (2) Cast Iron with Cork Inserts; (3) Fiber Faced with Cork Inserts.

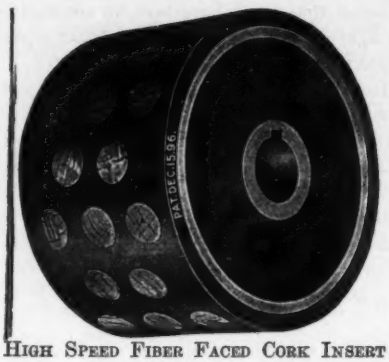


Fig. 4. High Speed Fiber Faced Cork Insert Pulley.

Worcester, Mass., Oct. 19th, 1907.

National Brake & Clutch Co.,
Boston, Mass.

Gentlemen: Below you will find table of results showing the relation between slip in per cent. and horse-power transmitted by the various pulleys tested by me. This table was made up from the curves on enclosed sheet according to your request.

Respectfully submitted,

(Signed) C. M. Allen.

Horse-power.	Per Cent. Slip. Cast Iron	Cast Iron and Cork.	Fiber and Cork.
1	0.23	0.217	0.155
2	0.46	0.43	0.310
3	0.70	0.65	0.465
4	0.95	0.86	0.620
5	1.20	1.085	0.775
6	1.50	1.30	0.930
7	1.85	1.55	1.085
8	2.35	1.80	1.240
9	3.35	2.10	1.395
10		2.43	1.55
11		2.85	1.72
12		3.40	1.90
13			2.12
14			2.35
15			2.70
16			3.18
17			3.95
18			

As certain parties in Lowell, Mass., wished to have a demonstration of the comparative efficiency of Cork Insert pulleys and pulleys not so equipped, and did not care to rely on the laboratory tests reproduced in part above, it was decided to run a series of tests at the Lowell Textile School and to invite agents, superintendents and others interested to participate in these tests.

I submit the following extracts from the report in order that you may know the results obtained without the necessity of sending for the full report.

REPORT OF PULLEY TESTS.

Made at the Lowell Textile School, Lowell, Mass. By G. H. Perkins, S. B., Head of Engineering Department.

These tests were made to determine the relative efficiency of various types of commercial pulleys both with and without Cork Inserts, and were conducted in the engineering laboratory of the Lowell Textile School. The conditions were as nearly as possible those of actual practice, and the greatest care was observed in maintaining them throughout all tests. The pulleys and belts were new and clean, but were run for a few weeks in preliminary trials before beginning the final tests. No dressing or preparation of any kind was applied to the surface of either pulleys or belt.

The pulleys tested were all eighteen inches in diameter, six inches face, and were of the following types:

(1) Wood Rim Pulley.
(2) Wood Rim Pulley, with Cork Inserts.
(3) Wood Rim Pulley, lagged with Leather.
(4) Steel Pulley.

The initial belt speed in all tests was about 1,550 feet per minute, and the initial belt tension was approximately 50 pounds per inch of width of belt. The comparison of power transmitted at two per cent. slip which is considered a commercial allowance is given in the first column of the following table:

TYPE OF PULLEY	H. P. at 2% Slip	Maximum H. P. Tr'nsm'td.	Slip in % at max-H-P.	Relative Value at 2% slip
Wood Rim Pulley, with Cork Inserts	11.8	13.2	4.6	100%
Wood Rim Pulley, leather lagged	8.7	12 4	4-7	73%
Steel Pulley	8 3	12.7	6 0	70%
Wood Rim Pulley	7.8	9.6	4.3	65%
Percentage of Gain of Wood Rim Pulley with Cork Inserts over same without the Inserts				51%
Percentage of Gain of Wood Rim Pulley with Cork Inserts over plain steel pulley without the Inserts				42%
Percentage of Gain of Wood Rim pulley with Cork Inserts over Leather Lagged pulley Without the Inserts				35%

Other tests were made which would indicate that the percentage of gain for the Cork Insert pulleys under conditions of less belt tension than that maintained throughout these tests would be even greater than shown above.

The result of these further tests will be given as soon as sufficient data can be obtained from additional tests which will be made as soon as the school is opened in the fall.

(Signed) C. H. Perkins.

The several reports from which these quotations are made show that main driving pulleys, receiving pulleys, and motor pulleys, together with loom spinning, and twister frame pulleys and, in fact, all pulleys which may be overloaded or on which slipping may occur, will yield better service if equipped with Cork Inserts than otherwise.

At the present time the least expensive method of using Cork Inserts in pulleys 12 inches in diameter and over, is found in the wood or wood rim pulley in which sockets for the inserts are easily and quickly bored. Both wood pulleys and wood rim iron arm and hub pulleys now in use may be equipped with Cork Inserts in the machine shops at the mills at small expense by obtaining the necessary directions and authority.

New wood rim iron arm and hub cork insert pulleys in any size may be purchased at reasonable prices. New cast iron pulleys to be thus equipped require a rim not less than one-half inch in thickness, and spinning and twister frame pulleys now being made for new machines are being so constructed.

Cast iron pulleys now in use on spinning and twister frames and similar machinery having thin rims may be backed with hoops of wood one-half inch in thickness prepared especially for this purpose; sockets may be then drilled through the iron and into the wood backing, and corks inserted at small cost, thus doing away with the necessity of discarding existing equipment. Cast iron pulleys can also be covered with a flexible fiber or lagged with leather and the corks inserted in the lagging.

At a later date there will be placed upon the market a steel pulley equipped with cork inserts which will supply an inexpensive cork insert pulley that may be used to advantage in places where wood pulleys are not considered suitable, and in this connection I submit the following:

"Gentlemen: Lowell, Mass., August 11, 1909.

Complying with your request for the results of the recent tests on steel pulleys conducted at the laboratory of the Lowell Textile School, I beg to submit the following report.

The two pulleys which were tested were as follows: No. 1 steel pulley 18x6 inches with cork inserts in the rim applied as per the invention of Lawrence Whitcomb United States Letters Patent May 18, 1909. This construction enables cork inserts to be used economically and effectively in the common types of commercial steel pulleys, and increases their frictional efficiency without impairing their lightness and strength. The corks were 1 inch diameter and 3½ inches on centers.

No. 2 steel pulley 18x6 inches with plain rim.

The apparatus and conditions under which these tests were made were identical with those described in the report of pulley tests already submitted to you.

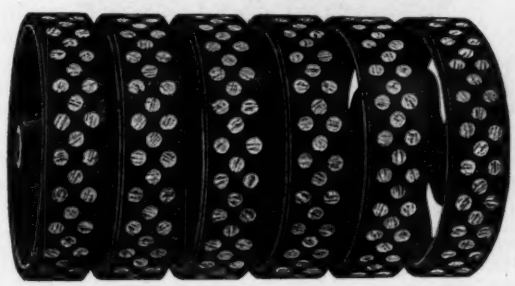


Fig. 5. Cork Insert Pulleys for Spinning Frames.

The summarized results of all tests made on these pulleys are as follows:

Type of Pulley	H. P. at 2% slip	Max. H. P. transmitted	Slip at Max. H. P.	Relative value at 2% slip
No. 1 steel pulley with cork inserts	13.3	14.5	3.6%	100
No. 2 steel pulley plain	8.3	12.7	6.0%	62.5

These results show the gain in efficiency of the steel pulley No. 1 with cork inserts to be 60 per cent. over steel pulley No. 2 with a plain rim under like conditions of slip.

The maximum power to which the tests were carried was 14 per cent. greater with No. 1 than with No. 2 and this with 40 per cent. less slip.

Trusting this will give the information desired, I remain, (Signed) C. H. Perkins.

USE ON MULES.

Many leather-faced mule friction cone clutches are being equipped with cork inserts under the composite method of construction above described, thus providing a clutch which is almost identical with that used in automobiles. The result of this equipment is the elimination of excessive slipping and the consequent wear and burning of the leather facings. This means greater efficiency and far longer life, thus doing away with the trouble and expense of frequent renewals.

LOOM FRICTIONS.

While it is true that at the present time a large proportion of cotton looms are driven by means of tight and loose pulleys, we are informed that a considerable portion of the heavier looms now being ordered are to be driven with the modern flat faced friction used so extensively on woolen and other types of heavy looms, owing to the quicker pick-up and other advantages incident to this construction. To

enable loom manufacturers to apply these frictional surfaces to their new looms, and to enable mill owners to replace worn and unsatisfactory leather facings, the so-called "Ready-to-Use" cork insert ring now in use on many

Fig. 6. "Ready-to-use" Cork Insert Fiber Rings.

thousands of looms, was devised. These rings are carried in stock by leading loom manufacturers and in the stock rooms of many mills for immediate application, when required, to looms now in use to replace worn or unsatisfactory leather facings.

The relative efficiency of a cork insert friction as compared with a leather faced friction is clearly shown in the report of a series of tests made by Professor Allen at the Worcester Polytechnic Institute for the Crompton & Knowles Loom Works, quotations from which report follows:

REPORT OF TESTS ON LOOM CLUTCHES.

"Gentlemen: I beg to submit herewith results of comparative tests made upon two types of loom clutches as furnished by the Crompton & Knowles Loom Works, Worcester, Mass. The face of one clutch was covered with leather; the other was inserted with cork.

The accompanying table gives the actual results and shows plainly that the cork insert clutch has less tendency to slip under the same load and with the same pressure upon the faces of the clutch than the one with the leather face; or, in other words, the cork inserted clutch will transmit more power than the leather faced clutch under the same conditions.

As seen from the table, the cork inserted clutch is capable of transmitting about twice as much power as the leather faced clutch, with the same total pressure on the faces of each clutch; or it may be stated that with each clutch, transmitting the same amount of power, about one-half as much pressure is required in the case of the cork inserted clutch as in the other. (Signed) C. H. Allen.

COMPARATIVE TESTS OF LOOM CLUTCHES.

Pressure on Clutch.	Torque. Cork Insert Clutch.	Leather Faced Clutch.
89.5 lbs.	19.50	16.95
151.5 "	34.20	17.66
213.0 "	46.43	23.09
275.0 "	57.05	29.46
337.0 "	73.33	35.09
398.0 "	92.24	41.31
460.0 "	96.48	47.56

Torque measured in pound feet.

SLASHER AND CALENDER FRICTIONS.

Owing to the presence of oil, the heavy duty required, and the heat generated by excessive slipping, these frictions are quickly rendered ineffcient, necessitating frequent and expensive renewals. Owing to the conditions met with in such service, the composite cork insert construction, above referred to, is used in slasher and calender frictions which are made of bone fiber in all required sizes, giving constant and uniform service for long periods.

Fiber, rubber, and leather slasher and calender frictions now in use, which have failed to give satisfactory results, may often be equipped with fork inserts in one's own mill at a nominal expense and be again put into service with greatly increased efficiency and durability. The service required of these frictions is similar to the severe use to which automobile clutches are subjected, in which use tens of thousands of cork insert clutches have given superb results.

Cork insert washers, ranging in size from those used on quilling machines which are about one inch in diameter, up to heavy drawing washers eight inches in diameter, are made with the right amount of cork area to give any required drag. These washers have very decided advantages over the ordinary felt washers, in that they are not affected by oil, water, dust, or atmospheric conditions, and, therefore, give constant and uniform results at all times.

I desire to say that in preparing this paper it has been my aim to present the principles involved in the successful use of cork inserts, rather than to enumerate all their possible applications; and if the matter now brought to your attention, perhaps for the first time, leads you to adopt cork inserts for any of the purposes described or to apply these principles to any of the many other frictional devices not herein referred to, in either event enabling you to overcome existing difficulties, I shall feel that it has not been written in vain.

MEETING OF TEXTILE EXHIBITORS ASSOCIATION.

The Textile Exhibitors' Association held a meeting on Thursday morning, September 23, at Bretton Woods, N. H., which was attended by representatives of many textile machinery and supply houses. F. H. Bishop, vice-president of the association, who has been acting as president since the resignation of George Otis Draper, outlined the work that the association had done and stated what they hoped to accomplish in the future. C. I. Campbell, secretary, read a statement showing the results of the exhibit which was made in Boston in connection with the previous convention of the National Association of Cotton Manufacturers held in April. The statement showed that after all expenses had been met, a refund of 40 per cent. had been paid to the exhibitors, and also that there was a substantial sum left in the treasury. Several concerns were made members of the association.

Officers for the ensuing year were elected as follows: Pres., Frederick H. Bishop, of Universal Winding Co., Boston, Mass.; Vice-Pres., H. W. Butterworth, of H. W. Butterworth & Co., Philadelphia, Pa. Executive Committee, E. F. Hathaway, of American Warp Drawing-in Co., Boston, Mass.; M. H. Merrill, of Allis-Chalmers Co., Boston, Mass.; D. A. Corey, of S. F. Bowser & Co., Fort Wayne, Ind.; and E. A. Rusden, of Textile Finishing Machine Co., Providence, R. I.

The question of giving an exhibition in the spring of

1910 was considered, and the association voted unanimously in favor of one. The exhibit given last spring was very largely composed of cotton machinery. It is proposed that the coming exhibit shall include woolen, worsted, silk, and knit goods industries, thus making it an exhibition of the entire trade. The executive board have already prepared extensive plans, and will soon be prepared to allot floor space. They have already received many applications. These exhibitions enable the manufacturers to see in practical operation the latest and best types of machines. Invitations will be extended to the different textile organizations to hold their meetings in Boston at the same date of the exhibition, thus drawing together a large number of representatives of the leading textile interests.

LETTERS FOR THE PRIZE CONTEST.

Letters will be received for the Contest until Oct. 15, 1909.

EDITOR'S NOTE.—The time for closing the Prize Letter Contest is drawing near, and in order that there may be no misunderstanding in regard to the date of closing, the following information is given.

All letters bearing a postmark dated October 15th or earlier, will be included in the contest. The letters will then be turned over to the judges, and the names of the winners published in the November issue.

There are no limitations as to the length of the letters; we suggested a length of from 600 to 1,000 words only as a guide.

The different letters will be published as rapidly as space will permit, in the order of their receipt at the office.

EDUCATION OF OPERATIVES.

(*Competitive Letter to* COTTON.)

BY W. W. R.

There are many tangible questions connected with cotton manufacturing to-day and a great many are being discussed by practical men. I have thought earnestly and have given my time to cotton manufacturing for many years, and to my mind only one safe line to follow to bring success is, educate your help.

All of the troubles that arise in the mill from the mixing room to the cloth room are due to mostly uneducated help. Many men write about uneven laps, sliver, roving, and yarn and other various causes, yet they never touch upon the most vital cause, which is the help. Secure the best help you can, educate them, not only in the mill but out of the mill, then when you have done this, all troubles will be eliminated, and quality, quantity, and success will surely follow.

CARDS, HOW TO SET THEM.

(*Competitive Letter to* COTTON.)

BY H. C. M.

It has been said, that the card is the most important machine in the mill; whether that is true or not, good carding is essential to the success of a mill, and it is the custom in all well regulated mills to have men of experience and ability in charge of this department. Poor carding means low production, high cost, more waste, and inferior product, as well as bad running work, which as a rule is very irritating to the help. It is first necessary to have good stock and an even, clean lap, good clothing, and licker-in, and if these are at your command, it is your fault if the sliver is not good.

A card should be ground about every three weeks, and if this is done, with light grinding, machines kept well oiled and cleaned, and set correctly, there is no reason why the sliver should not be even, clean, and strong. As to the proper settings, they vary according to the stock run, and so many other things, that it would be impossible to formulate a rule that would work; but for this I will say, that using good cotton, of one inch staple, on 50 to 60 grain sliver, one should set about as follows:

In setting a card at all of the important points, as when new or overhauling, set doffer to a 7 gauge; comb to 12; flats to 9 at front; 10 at back; licker-in at 10; and feed plate at 12. These are settings that should be attended to every time a card is ground, except the flats, which are set every second time. The front knife plate is set according to the amount of strippings desired; the closer the setting, the less strippings will be made, and the wider the setting, the more waste will be made.

When setting the screens, mote knives, etc., set the cylinder screens under the card, and place the bolts in position, but do not tighten. Test the space with long gauges which are made for this purpose. See that the licker-in is set correctly; take licker-in out, put quadrant gauge in its place, set licker-in screen to this gauge to 34 at the bottom, 10 at top; then push up cylinder screens to the long gauge and tighten with front of screen ¼ inch off, and back set to gauge, which is about 34 leaf gauge. Place licker-in in place and set mote knives to top 10; bottom 12; leaf gauge. Set back plate from 17 to 34 leaf gauge at bottom. I like 34 best, as it allows the cotton to expand more, and the flats have a better chance to card the fibers out. Set other parts as stated above, and turn cylinder and licker-in by hand, to see that everything is clear and free; then start up and you will have good carding as is possible from the stock.

YARN AND CLOTH CALCULATIONS.

(*Competitive Letter to* COTTON.)

BY W. E. F.

To find the average count of yarns for weaving sheetings, drills, or evenly constructed cloth: Deduct 4 from the sley and add sley and pick together; multiply the sum by width of cloth in inches, and multiply the result by the weight of goods or yards per pound. Divide this product by 735. The result is average counts of yarn. Example:

Goods to be 36 inch—56x60—4.00 yards to pound.

56—4=52 sley. 52+60=112.

$$\frac{112 \times 36 \times 4}{735} = 29.94\text{s Average count of yarns.}$$

Suppose we have an average yarn of 21.94s and we use 21.50s warp, what number filling must we use?

Rule.—Multiply average yarn by 2 and deduct known yarn, and the remainder is unknown yarn. Example:

$$21.94\times2=43.88.$$

$$43.88-21.50=22.38\text{s filling.}$$

This is a practical rule and although not theoretically correct, it is close enough for practical purposes.

To find the number of cotton yarn when the weight in pounds and the length in yards are known: Rule:—Divide the length in yards by the weight in pounds, and multiply by 840.

Example:—252,000 yards, weight 10 pounds, what is the number of the yarn?

$$\frac{252{,}000}{10\text{x}840}=30\text{s yarn.}$$

To find the weight when the length and number of yarn are known:—Divide the length by the number of the yarn multiplied by 840. (I will use the same weight, length, and counts of yarn in these three examples so as to be easily understood.)

$$\frac{252{,}000}{30\text{x}840}=10\text{ pounds.}$$

To find the length of yarn when the weight and counts are known:—Multiply the weight by the count and by 840. Example:

$$10\text{x}30\text{x}840=252{,}000\text{ yards.}$$

The following are a few brief rules that are very handy in figuring for cotton cloth and yarn:

(1) To find ends on a beam:

$$\frac{\text{No. of yarn x 840 x pounds}}{\text{Yards}}=\text{ends on beam.}$$

(2) To find the weight of a warp:

$$\frac{\text{Ends x length in yards}}{\text{840 x No. of warp}}=\text{weight of warp.}$$

(3) To find pounds of filling:

$$\frac{\text{Width in Reed x picks per inch x length in yards}}{\text{Number of yarn x 840}}=\text{lbs. of filling.}$$

(4) To find the number of warp:

$$\frac{\text{Ends x length in yards}}{\text{840 x pounds of warp}}=\text{Number of warp.}$$

(5) To find the number of filling:

$$\frac{\text{Width in reed x picks per inch x length of cut}}{\text{840 x pounds of filling}}=\text{Number of filling.}$$

(6) To find picks:

$$\frac{\text{840 x pounds of filling x No. of filling}}{\text{Width in reed x length in yards}}=\text{picks per inch in cloth.}$$

(7) To find the number of yards a certain number of pounds of filling will weave:

$$\frac{\text{840 x weight of filling x No. of filling}}{\text{Picks per inch x width in reed}}=\text{Yards of cloth.}$$

The application of these rules may be best illustrated by an example. Give the weight in pounds of both warp and filling contained in 100 yards of the following cloth: 36 inches—56x60—4 yards per pound. We will suppose the cloth to be woven 38.5 inches wide in the reed, and the warp to have taken up 5 yards in weaving; the sizing amounts to 8 per cent. and 24 selvage threads are added. We use 21s warp and 23s filling.

First, use rule No. 2:

$56\times36=2016+24=2040$ ends in warp.

$$\frac{2040\times105}{840\times21}=12+14\text{ lbs. of warp}+.97\text{ (8\% size to be added}$$

$=13.11$ pounds warp and size.

Second, use rule No. 3:

$$\frac{38.5\times60\times100}{840\times23}=11.90\text{ pounds of filling.}$$

$13.11+11.90=25.01$ pounds of warp and filling.

THE MANAGEMENT OF HELP.

(*Competitive Letter to* COTTON.)

BY C. L. H.

This is a subject that has, I think, grown to colossal proportions owing to the rapid multiplication of cotton mills, which offer additional employment to so many people, thus making it so easy to obtain work. It is one of the gravest propositions that confronts the mill manager to-day. It is a self-evident fact to every wide-awake manufacturer that the man who can not successfully manage help is rapidly becoming useless as a superintendent, for it takes good help to run a mill.

In the first place, I consider that a successful manager of help must be a man, and when I say a man, I mean it in every sense that the word implies. And further, he should be a man all the time; he should also strive to be at his best morally and socially. He should always be found on the sound and safe side of every moral and social issue that is brought before the community in which he lives. Now, I am well aware of the fact that many men, at least until recent years, have attached very little importance to the moral and social qualifications of a manager of help. But let us pause right here and think for a moment of the effect of the morality and sociability of our superiors upon us, and to what extent these qualities have contributed to their success in controlling us.

Let us not try to deceive ourselves into believing that our community and our help are indifferent to these things, though they may sometimes seem to be. Many a time you will, if you are a manager of help, be the subject of discussion around the tables and the firesides of your operatives, and if they are able to link your name at all times with that which is clean, pure, and manly, whether they be children or adults, and especially if they be children, it will stimulate them to imitate you, and will give tone to their conduct, which will make a tremendous contribution to your efficiency and influence when they come under your control. So much for the moral and social qualifications of an overseer.

Now I think the next most valuable asset that an overseer can have to successfully manage help is a competeut second hand, and a set of section men who are interested, careful, friendly, tactful, and impartially courteous to the operatives. This need not, when intelligently practiced, eliminate any of the rigidity of system, for I heartily en-

dorse a reasonably rigid system. Since it is very seldom that an overseer finds, on going to a new position, a set of men possessing the above mentioned qualifications, and since he often can not hire them, it is his duty to train them, and instill these qualifications into them. An overseer must have, for the sake of example, if for nothing else, a second hand and set of section men who are interested in their work. For their examples are contagious and spread rapidly.

There are several things by which an overseer may awaken the interest of his men, but I shall just mention one which I consider productive of the best and most permanent results, and that is, to stay in close, friendly, but not familiar, touch with them and encourage them to diligently apply themselves to the mastering of the details of the machinery in their charge. They should also try to discover any defects that may exist and discuss the remedy for it.

There are many overseers in the country who seem to think, or who want to create the impression, that they know it all and are not willing for any one, especially their own section men to teach them anything new. The fact of the business is that every practical man knows that there are small peculiarities about every job, and oftentimes about several machines on the same job that no man knows or ever will know, except the man who puts on the overalls and works around the machine for hours at a time watching and studying for those peculiarities.

There are not one-third of the men on sections to-day who are going to do this when they feel that when they make the discovery, they are not going to receive any encouragement or credit for it from the overseer. I know an overseer now who is losing immeasurably in the quality of his production just on account of the above named trouble. He has a man in his room who practically holds the key to his trouble, but this man's ideas have been snubbed and discouraged by his overseer until now he has no idea of trying to put them into execution. Thus it is greatly to the advantage of the overseer to furnish the incentive, and inspire and spur his men on to closer application and greater development in usefulness for his employer.

Now, in regard to the treatment of help in general, each overseer should in his daily duties so impress his help that each one in his room, from second hand down to sweeper, would feel sure that when he comes to him with a reasonable request or grievance he will at least receive careful consideration and an impartial hearing.

An overseer can by his careful example and precept train all those in authority under him to accord those under them the same kind of treatment. An overseer should train his second hand and section men up to the highest point of efficiency, and then stand behind them and support them to the limit of consistency, and make every hand in the room feel that he or she will be promptly punished for any violation of any set rule and punished, too, without fear or favor. I have no sympathy with the idea that is abroad in the land that you have to be lax and loose with help in order to hold them. I believe that if the ideas as set forth were put into effect in the mills of this country to-day, they would add greatly to the effectiveness of the management.

MARKET REVIEWS.

THE COTTON MARKET.

(*Contributed exclusively to* COTTON.)

BY H. AND B. BEER.

Unfavorable as were crop prospects one month ago, the outlook to-day is more discouraging. Weather conditions during the past four weeks have been abnormal, which has been the case in the western half of the belt during the entire summer; excessively hot and too dry for vegetation in all sections of the belt has been the rule. The first two weeks of September, notwithstanding the month of August to have been the hottest on record, were very hot, the warmest for this period of the year in the history of the Weather Bureau. Consequently, reports from the country are to the effect that the crop has suffered further deterioration.

The September 2nd Bureau crop condition report 63.7 against 76.1 last year and 72.7 year before last, was the lowest for September on record. Meanwhile the deterioration has continued and to such an extent that it is possible that the Bureau report of October 2nd, the last of the season, will be the lowest on record for October. It will compare with 69.7 last October, 67.7 year before last and the previous lowest October report of 58.3 in 1902. The less favorable crop prospects have been the means of causing a reduction in crop estimates, which now range from 11,000,000 to 12,000,000 bales, the consensus of opinion being that the total yield will figure about 11,500,000 bales compared with 13,825,000 bales one year ago. At the close of last season the world's visible supply of all kinds of cottons was made up as follows:

August 31st.	1909	1908	1907
Visible supply of American..	1,472,000	989,000	1,344.000
Visible supply of foreign....	499,000	747,000	959,000
Total vis. supply of world.	1,971,000	1,736,000	2,303,000

Foreign crops vary but little in size from year to year, and for that reason exert a very small influence in the ultimate yield of the world. It is not so with the American crop which shows a variation from about 500,000 to 3,500,000 bales from season to season. This year it promises to be about 2,325,000 bales less than one year ago. Therefore, since the world's visible supply of all kinds of cottons is only 235,000 bales larger than last year, and actually smaller by 332,000 bales than in year before last, the indicated yield this year, which points to about 11,500,000 bales, becomes the most important factor to the trade, particularly when it is realized that the world actually consumed 13,157,000 bales of American cotton the past season, spinners takings having been 13,314,000 bales.

These features were virtually known one month ago, but the market at that time hesitated to advance owing to the fear that receipts in September would be heavy on account of the premature opening of the crop and that the demand would not be sufficient to absorb the offerings, as farmers, it was thought, would be apt to be free sellers around 12 cents. At that time we expressed the opinion that

there would be no great pressure on the market around 12 cents, and in event of market declining temporarily, it would afford an opportunity to provide for future requirements on a comparatively cheap basis. At that time January was around 12 cents; now January is around 13 cents as a result of uneasiness over the Gulf storm that worked inland through Louisiana and did more or less damage in a general way on its way northwestward.

The higher prices realized in September, however, were due to the crop having deteriorated further; to the urgent demand from Europe for early receipts, especially for the Continent, and because farmers refused to offer freely when the market declined below 12 cents in the interior. The present level, about 13 cents for winter options, is unusually high for so early in the season, yet warranted by the shortness of the crop and the needs of the world.

The market will be sure to experience violent fluctuations at times, but advantage should be taken of every opportunity to buy on important breaks, as we feel confident that values are due to go much higher before half of the season is over.

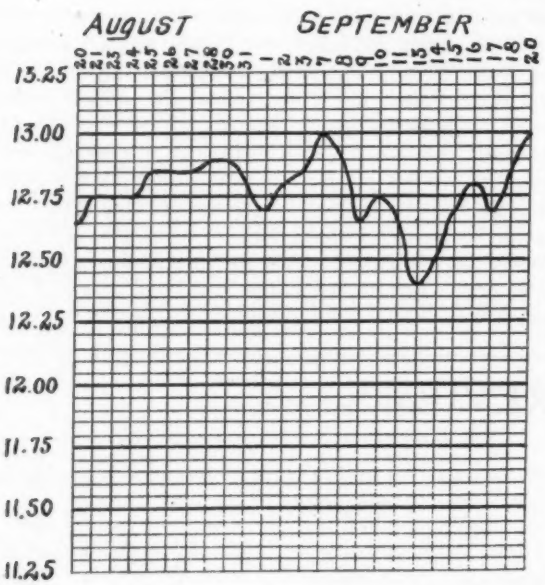


Diagram New York Spot Cotton, Aug. 20-Sept. 20, 1909.

Large early ginnings and heavy early receipts are more reflective of a small than a large crop, and the present run of arrivals and rapid ginnings are due in a great measure to the crop having opened prematurely in all sections and to the desire of farmers to dispose of their cotton above 12 cents at home. The Texas crop is so short that we hear of picking having been completed in some sections already. Indications are that this will be a very short cotton season.

The accompanying diagram shows the fluctuation in price, from day to day, of spot middling upland cotton in the New York cotton market.

The latter part of August recorded very little movement in price. The first part of September witnessed a rise to 13 cents on the 7th, and then a rather precipitate drop to 12.40 on the 13th.

An irregular advance then set in, and 13 cents was again recorded on the 20th.

THE YARN MARKET.

The situation in the cotton yarn market continues to show a very unsatisfactory state of business, and it seems only a question of a short time when some radical step will have to be taken, either by the spinners or by the consumers, to relieve the present condition of affairs.

There is very little raw stock held by the spinners that has not averaged them very nearly twelve cents, in fact, it would seem that one should be counted lucky to have cotton on hand at that price. But even at that price the spinner can see but a very small margin of profit, if any, with the present bid prices for his product. As a matter of fact, there has been very little business transacted, owing to the disparity of the bid and asking quotations on all numbers. The buyers seem to be in no urgent need of yarn and are holding out for concessions from the nominal price asked.

Dealers state that last month was one of the dullest experienced for quite awhile, and they do not see any hope for a material change, unless a different attitude is taken by the buyers.

It is thought that the recent important rise in the price of cotton will have a tendency to bring out inquiries for yarns.

The opinion prevails in many quarters that the present prices will not in any case be reactionary.

The market during the middle of last month was very quiet with scarcely any business transacted, except some few lots of stock yarns. Prices were a little weaker than for some time owing to the need of business by some of the spinners who had to make concessions to move their stock. This was only temporary, however, and it seems that the deadlock between dealers and buyers shows no material change. Buyers are conceded to be in a rather strong position, as they have sufficient stocks on hand to meet their requirement for some time, at the present rate of consumption which is very small compared with some previous seasons.

THE KNIT GOODS MARKET.

Buying for the spring season of 1910 was practically completed about the middle of last month. The large mills sold up their productions earlier than the smaller mills, but nearly all of them are now comfortably supplied with orders. Taken as a whole the business has been very satisfactory to the mills, although it is now realized that the initial prices of the different lines were too low. Those mills that had sufficient yarn at the time the contracts were made will fare all right, but others that met these prices without the proper supply of yarn will probably have cause for complaint.

Domestic full fashioned goods have had a better season than was anticipated, owing to the large quantity of imported goods that came over just before the new tariff bill was passed. Dealers in the domestic lines, however, have not advanced prices in proportion to other lines, and as a consequence, has had the desired effect with the trade.

A good duplicate order business in all lines is looked for, at advanced prices. Fleeced lined hosiery has had a splendid season, and a great many duplicate orders have been turned down, on account of the large number of original orders, which are now being gotten out.

SOUTHERN MILL SITUATION.

(*Special Correspondence.*)

Mill men in this section are depressed over the condition of yarn and cloth markets. Numerous manufacturers have been interviewed and say they can not do business at the present prices of raw material and low prices quoted for cotton goods. A gentleman prominently identified with the soft yarn trade says unless there is improvement at an early date in prices of yarns, mills will have to close down or curtail heavily. Another well known authority expresses confidence that in the near future prices on cotton goods are bound to rise; he argues that high priced cotton always leads to high prices for cotton goods.

Curtailment, especially among the yarn mills, has been carried on for many months to a considerable extent, but despite all efforts to effect a boosting of market prices, the ends desired have not been secured, and mill men generally are rather gloomy over the situation.

Numerous mills, particularly cloth mills, have bought their cotton ahead and are not suffering from the necessity of buying high priced cotton. Many others, however, that are forced to buy as they need raw material, are facing a serious problem of continuing operations. The increase in manufactured goods has not been commensurate with the increase in raw material, and unless the market improves materially at an early date, it is a question whether the mills will be able to keep up operations.

Southern mill men are deeply interested in the talk among New England mills of advising a shortage of operations amounting to two days per week. Just what policy will be followed by Southern mills in the event the markets fail to improve remains to be seen, and the outcome is the subject of interested speculation on all sides.

Local retail dry goods trade is splendid. Several large dealers in the South were interviewed concerning their present business, and in every case, reports were most encouraging. Farmers are getting a good price for their cotton. They have plenty of money and are liquidating their debts rapidly.

Despite the unfavorable condition of the markets, and the gloomy outlook for trade, capitalists continue to evidence their faith in the industry by investing freely in new mill properties. At the rate so far this year, 1909 will be a banner year in new mill construction work in the South, and North Carolina will lead the States in this line. The large amount of money being invested in mill construction and improvements has benefited other dependent industries, such as lumber, etc. The railroads are spending freely in road improvements, too, which means more money in circulation and greater activity in the industries of the South.

Ten millions of dollars, or more, will be invested in new mills in the South this year, at the present rate of expenditure.

NEW ENGLAND MILL SITUATION.

(*Special Correspondence.*)

The purchasing power of the $30,000,000 of new capital that is going into the textile industry in New England this year has done more to create and stimulate general industrial, commercial, and mercantile prosperity in this group of states than any other economic condition. This sum of money going directly into the textile industry represents about one-third of the amount that is actually being expended for the direct and indirect progress and expansion of the industry. Wherever new mills and additions are going up, there is great activity in general building of tenements, overseers' houses, and stores.

There is no doubt but that the backbone of New England's prosperity to-day is due to the expansion of the cotton industry for the past fourteen months. A large mill contractor in New Bedford recently told the writer that there never was a time in the history of his business experience when deliveries on iron and steel for new constructions were so difficult to get as at present. He also stated that lumber was also very scarce in New Bedford. This gentleman stated that next year would witness greater textile activity in the State of Massachusetts than ever before.

During the past month the only cloud in the textile horizon was the strike at the Fall River Iron Works and the general labor agitation in New Bedford. The Iron Works strike was caused by a large quantity of poor yarns which materially reduced the earnings of the weavers. They struck for 10 per cent. increase, until the poor yarn had all been used up, but Mr. Borden gave them a permanent increase of 5 per cent., which proved to be a satisfactory arrangement. The operatives of Mr. Borden's mills are now the highest paid textile operatives in Fall River, receiving 21.73 cents per cut of 50 yards.

The New Bedford labor agitation has been submitted to the State Board of Arbitration and Conciliation, and will be settled early in October. Everywhere else labor is quiet and well satisfied with the present wage schedule.

The demand for fabrics is not as satisfactory as it should be, but manufacturers are confident that general industrial prosperity will develop this side of the market. Prices are holding up well and certain lines of ticketed goods are selling at highest prices recorded for three years. Bates seersuckers, and all lines of dress ginghams and chambrays were in particular request last month. It is quite unusual for ginghams to have a good sale in September, but such is the case this year.

Finishers were active in the gray markets last month and held prices firm on all lines. Sheetings appear to be well taken care of, and any slight concession brings active buyers into the market. There appears to be an abundance of orders just under the market for all lines of sheetings and prints, which fact will prevent any material reaction in prices. Selling houses are emphatic in stating that prices can not react or even sag with the raw cotton up to 13 cents, and they are advising their customers to take on heavy lines.

The duck market appears to be strengthening—both the demand and prices. The Consolidated Cotton Duck Co. enjoyed a splendid export business during last month, and leading interests in that corporation state that the domestic business was very satisfactory and quite a surprise to the officials of the company. Wellington, Sears & Co., of Boston, are holding prices on light and heavy ducks very firmly, and appear to be unwilling to make slight concessions to land sales. Their accounts are well taken care of and they state that their stock of goods on hand is very small. Their West Point and Langdale, Ga., mills are operating full capacity and making satisfactory profits, while the Boott Mills at Lowell are having a good run on drills and light army ducks.

The ticking market holds firm with prices at top notch

for all lines. Bliss, Fabyan's Mills are sold ahead on light weights and are receiving just enough orders for the heavier weights to prevent the accumulation of a stock. The South American trade is taking large shipments of half pieces.

Since the government report on cotton, there has been a slight reaction in the yarn market, although prices are only a shade lower for certain counts. Two-ply yarns have been selling more freely than single yarn and it is generally understood that after the first of the month spinners will advance prices fractionally for the more active counts in soft yarns.

When one hears of a sale under the market he is pretty apt to learn that the yarns came from stock. As an illustration, 2-20s warps sold as low as 20 cents, while the average market price was 20½ cents and most of the spinners would not accept business at less than 21 cents. Knitting yarns are in very good request at firm prices and stocks appear to be greatly reduced since the middle of the year.

Export orders are very few and far between. There is little or no business in the Orient, because of the large stock carried in Japan and China over the summer months in anticipation of the higher raw material market which has most effectively developed. The China trade discounted higher prices six months ago and are supposed to have sufficient goods on hand for the balance of the year. The Red Sea trade has taken drills during the past four weeks in good quantities and at best prices, and there is a report that large orders are to be placed next month for late winter delivery.

It is reported that there has been some buying of heavy weight grays for the South American market, although the reports have not been confirmed. Staple ginghams have been shipped to South American countries in September on old contracts.

Among the machinery manufacturers there is nothing but activity and prosperity to chronicle. All of the textile machinery makers are sold far into the coming year and at prices that will show a good round profit when books are balanced at the end of the year. There is hardly a day that the larger machinery builders do not get a large contract for a new mill or extensive additions to an old plant. Loom builders are reporting record breaking business, while one year ago the situation was quite the reverse. Belting and general mill supply manufacturers are operating full capacity with an abundance of orders. Everywhere, business is prosperous.

Textile mill stocks are holding at best prices of the year. There are a large number of orders in the market to buy standard cotton mill stocks at within five to ten points of the last sale, but, whenever a block is offered at auction, it is either withdrawn and sold privately or, if sold, goes to an investor willing to pay ten to twenty points higher than the previous sale. Because cotton mill stocks are tax free in the state of their incorporation, there is a large demand for such gilt-edge issues as Bates, Androscoggin, Pepperell and Amoskeag. There has not been a sale of Bates for several months, while a leading cotton share broker has eleven orders for Androscoggin aggregating a demand for 748 shares at prices from five points under to 25 points above the last sale. New Bedford shares hold firm with very little activity. Fall River issues are slightly reactionary but the situation is not serious for there are very few offerings.

THE SHAMBOW SHUTTLE.

The Shambow Shuttle Co., of Woonsocket, R. I., is putting out patented hand-threading shuttles which are pronounced by practical mill men to be one of the most successful hand-threading shuttles on the market to-day. It has been in use in the best and largest mills in this country for three years. Where it has been once used, repeat orders always follow. It is a simple device, as there are no more parts to this shuttle than to the suck shuttles. It is merely a threaded bushing, slotted on one side to allow the thread to enter, a slot cut in the side and top of the shuttle, connecting with the slot in the bushing, and a small shoulder left in the wood, that partly covers the hole in the end of the bushing. This effectually prevents the yarn from coming out after the shuttle is threaded. There is no plate on

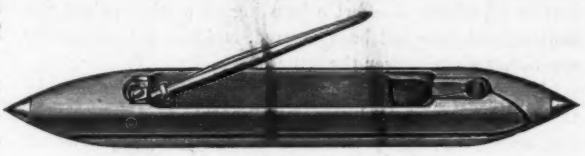


Fig. 1. The Shambow Shuttle.

top of the shuttle which most hand-threading shuttles have, and always proved more or less a source of trouble, as the plates would work loose and make bad cloth.

This company is also putting on the market a little device to be used in connection with the Marble shuttle spindle which has always been considered one of the best all-around shuttle spindles used, but it had one defect, namely, that it had a tendency to split the top of the shuttle where the spindle hit the wood in raising. A patented staple is being used at the base of the spindle that effectually prevents the shuttle from splitting or wearing at this point. There is another good feature to this patented staple, and that is, that the prongs of the staple are driven in the shuttle, just in front of the pin that holds the shuttle spindle, and prevents the spindle pin from breaking out the wood into the shuttle. These staples have been in use about a year, and are giving satisfaction wherever used.

The Shambow Shuttle Co. has been busy all through the recent depression, running full time, with a full complement of help.

MILL NEWS.

Notices of mill projects, additions or improvements are solicited for this department.

Arkansas.

FORT SMITH. Great Southern Cotton Mill, it is reported, will be organized by F. S. Lowrey and Wm. H. Talmadge.

HOPE. R. L. Pritchard is interested in the organization of a company to build a mill for knitting hosiery and underwear. C. Winchester, Miller Bros. of this city, and W. P. Davis of Chattanooga, Tenn., are interested. The plant will be run by electricity.

MONTICELLO. Monticello Cotton Mill officials are reported to be interested in a plan to organize another company with a capital stock of $500,000 to build a cotton mill at this place.

California.

OAKLAND. The California Cotton Mills Co., has purchased

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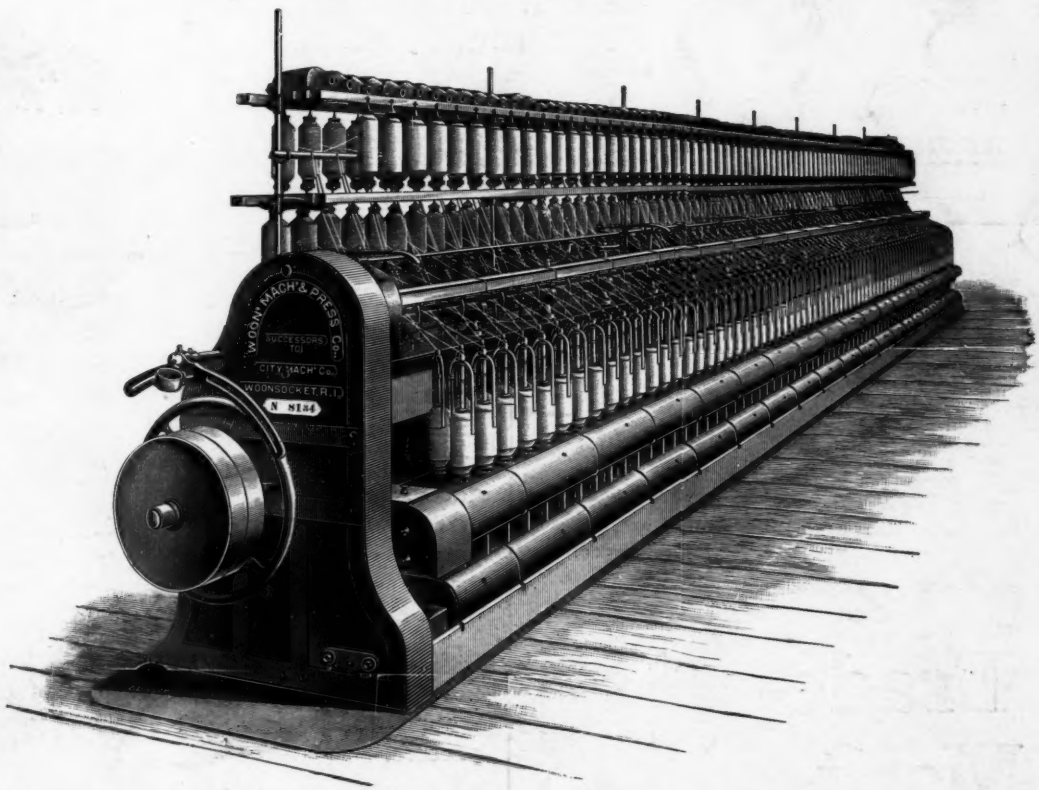
THE SPEEDER

WITHOUT A HORSE-HEAD



STUART W. CRAMER,

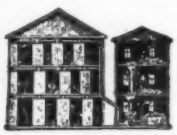
Southern Representative. Charlotte, N. C.

ALPHABETICAL INDEX TO ADVERTISERS PAGE 86. CLASSIFIED INDEX PAGE 87.

ALL TESTS HAVING BEEN MADE FOR EFFICIENT AND ECONOMICAL CLEANING, **SAVOGRAN** HAS TAKEN FIRST PLACE, SO SAY THE MAJORITY OF COTTON MANUFACTURERS

HIGHEST AWARD MEDALS 1893, 1887, 1878

INDIA ALKALI WORKS : : BOSTON, MASSACHUSETTS



CHARLES H. SCHNITZLER

Patentee and Sole Manufacturer of

THE PNEUMATIC CONVEYOR

For the handling of wool and cotton stock, rags, excelsior, jute and all kinds of fibrous material, wet or dry. Also spool elevators, steam heating and ventilating and mill work generally. Blower and fan work a specialty. This conveyor is patented. Beware of infringement.

Satisfaction Guaranteed

215 NORTH SECOND ST., - - - - - - - PHILADELPHIA, PA

FOR SALE.

Tolhurst Belt Driven Hydro-Extractor.

40" COPPER BASKET. BUT LITTLE USED.
WILL SACRIFICE FOR QUICK SALE.

A. H. WASHBURN, - Cotton Mill Machinery, - **CHARLOTTE, N. C.**

The Function of a Trade-Mark.

is not to furnish a puzzle to be solved, but a sign by which a given commodity may be recognized. It is a safe principle that the impression made by a trade-mark on the mind of a purchaser will be about as clear as the representation of the brand on the goods.

Clear and attractive stamping of trade marks on all grades and weights of Cotton, Woolens, Silks, etc., is possible only by the Kaumagraph process. Stamping is done in silver, gold and all colors and the instant drying of the impression admits of more rapid handling of goods than by any other process.

KAUMAGRAPH COMPANY

156 FIFTH AVE., - NEW YORK

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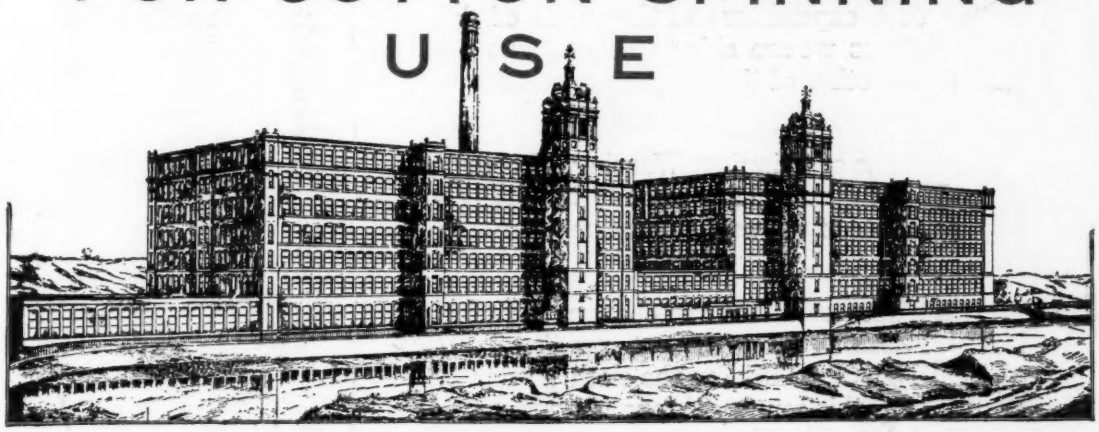
FOR COTTON SPINNING

U S E



The above mill containing 326,160 Mule Spindles has (excepting the carding engines,) all the Machinery Driven by

"CAMEL HAIR" "CAMEL" BRAND BELTING

TRADE MARK REG.

COMPARISON OF PRODUCTION

We are indebted to the Proprietors of Two sets of Cotton Mills containing 250,000 Spindles each, and producing the same quality and counts of Yarn, for the following Table of Production

FIRST SET. Driven by LEATHER BELTING

Hours of work per week	Size of Yarn	Turns per inch twist	Average Production per week
56	62's twist 72's twist	27	21.20 hanks per spindle 19.41 " "

SECOND SET. (with the exception of Carding Engines) DRIVEN ENTIRELY BY "CAMEL" BRAND BELTING

Hours of work per week	Size of Yarn	Turns per inch twist	Average Production per week
56	62's twist 72's twist	27	24.60 hanks per spindle 22.50 " "

Showing 17½ per cent. gain in production!!

SOLE MANUFACTURERS ROSSENDALE-REDDAWAY BELTING & HOSE CO.

Mills and Head Offices: - - - NEWARK, N. J.

ALPHABETICAL INDEX TO ADVERTISERS PAGE 106 CLASSIFIED INDEX PAGE 107

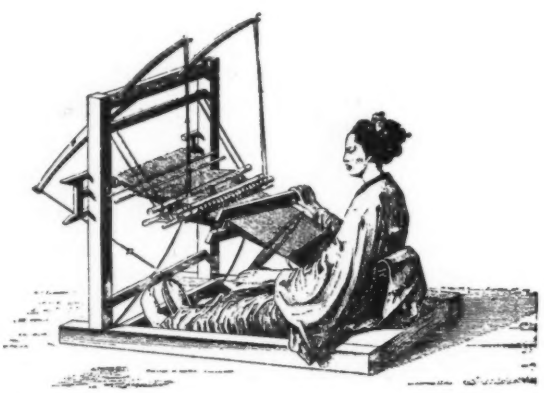
IT PAYS TO USE NORTHROP LOOMS

THE DRAPER COMPANY has always manufactured patented improvements, taking out more patents per year than any other corporation in the United States, with one exception.

Continual application is needful for the success of a business founded upon the introduction of patented improvements. We have a large force of inventors and draughtsmen busy with the betterment of our product. Through the expenditure of thousands of dollars and constant effort after many failures we are able to bring about continually some betterments in some one or other of the products of our shops.

In the line of Spinning, Warping, Spooling and Plain Weaving, we claim most of the really vital improvements of the past thirty-five years.

It has been said that our changes in the SPINNING FRAME alone made a profit of FIFTY MILLION DOLLARS for the cloth producer and consumer in this country through the introduction of over eight million Sawyer and Rabbeth Spindles.



Since 1895 the Draper Company has sold over one hundred and fifty thousand Northrop Looms; a machine that produces such economies to the purchaser that the saving effected more than justifies much higher cost.

DRAPER COMPANY

HOPEDALE, MASS.

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DUXBAK BELTING
TRADE MARK

Experiences of this kind are common enough each spring, in shops situated on river flats, but if Schieren's "Duxbak" Leather Belting had to depend on this and other cases where belting comes in direct contact with water there would be little sold.

Moisture in the air creates a condition in ordinary belting that weakens it at that time and injures it for all time.

"Duxbak" is the same husky puller no matter what the barometer shows.

We make two kinds of "Duxbak"
WATERPROOF and STEAMPROOF

Send for a belt of either and our SATISFACTION-OR-RETURN-YOUR-MONEY-GUARANTEE.

CHAS. A. SCHIEREN COMPANY

ESTABLISHED 1868.

Tanners, Belt Manufacturers. 39 Ferry Street, NEW YORK

Boston, 191 Lincoln St. Philadelphia, 226 North Third St. Denver, 1622 Wazee St. Pittsburg, 239 Third Ave. Chicago, 89 Franklin Ave. Hamburg, Germany, Auf dem Sande 1. Henry Simon, Ltd., 20 Mount St., Manchester, Eng., Sole Agents for the United Kingdom. OAK LEATHER TANNERIES, Bristol, Tenn.

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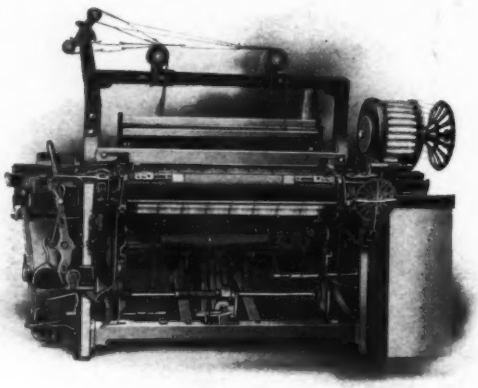

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Since 1895 The Draper Company has sold over

One Hundred And Fifty Thousand NORTHROP LOOMS.

The great efficiency and earning effectiveness of the NORTHROP LOOM produces such economies to the purchaser that the savings effected more than offset the higher cost of installation.

We keep a full line of loom parts on hand at our Southern Supply Office No. 40 South Forsyth Street, Atlanta so that we may be able to offer the most prompt service, at the same time assist the Southern Mill man to save freight charges.

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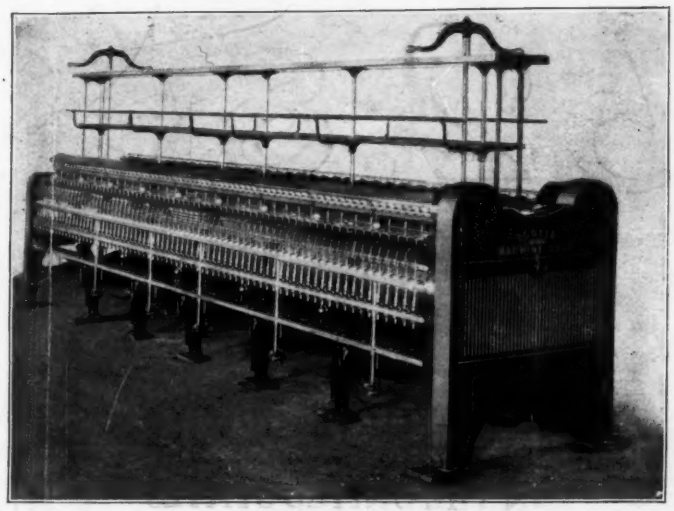

SPINNING FRAME

PLANS & ENGINEERING FOR COTTON MILLS

SOUTHERN OFFICE, PRUDENTIAL BLDG., ATLANTA, GA.

JOHN HILL, SOUTHERN REPRESENTATIVE.

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IT PAYS TO USE NORTHROP LOOMS

RESULTS COUNT.

The Cordis Mills of Millbury, Mass., weaving ticks, replaced 212 common looms which were operated by 52 weavers with 204 Northrop Looms, which are operated by only 13 weavers and are producing more and better cloth.

152,859

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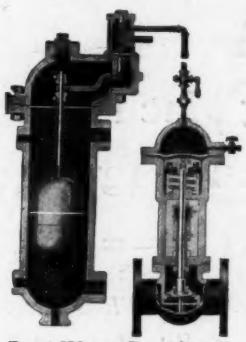

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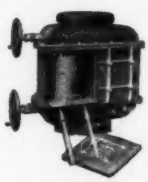

Twin Strainer

Oil Purifiers

EQUIP

YOUR POWER PLANT WITH

Liberty Steam Plant Accessories

and they will effect economies, eliminate extravagant wastes and increase the dividends of your mill.

MAY WE TELL YOU HOW?

Faber Blow-Off Valve

LIBERTY MANUFACTURING COMPANY,

6605 SUSQUEHANNA ST., PITTSBURG, PA.

Turbine and Cyclone Tube Cleaners

Separator for Steam and Oil

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Northrop Looms
Twisters
Spoolers
Warpers
Balling Machines, Reels,
Banding Machines

MIRROR SPINNING RINGS
(Trade-Mark Reg. U. S. Pat. Off.)

DUTCHER TEMPLES
(Trade-Mark Reg. U. S. Pat. Off.)

Rabbeth Centrifugal Clutch Spindles
Rhoades-Chandler Separators,
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and other patented Improvements
in Cotton Machinery.

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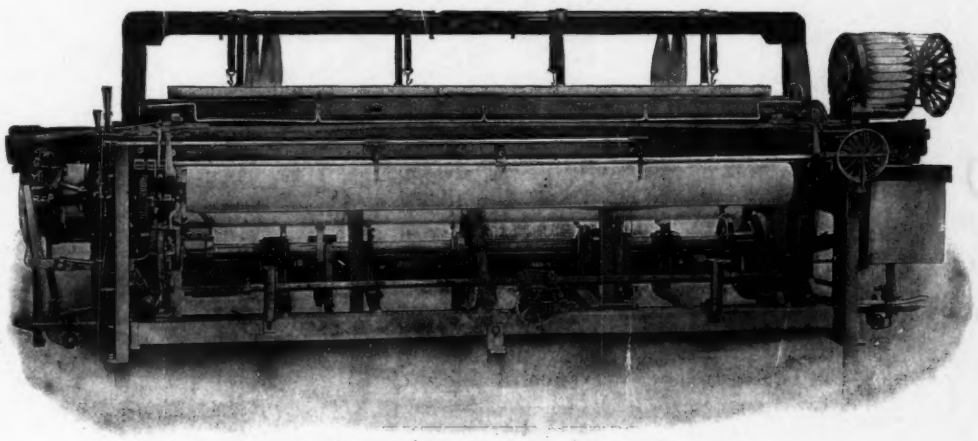

"L" MODEL LOOM

¶ We have orders on our books from practically every maker of broad sheetings in the North for looms similar to above---replacing common looms.

DRAPER COMPANY

HOPEDALE, MASS.

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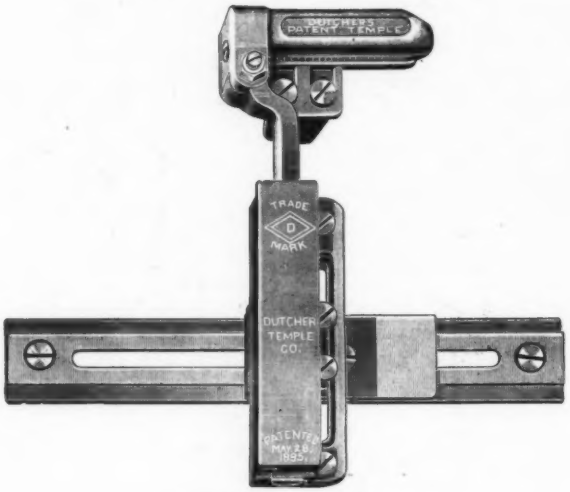
IT PAYS TO USE NORTHROP LOOMS

Northrop Looms, Twisters, Spoolers,
Warpers, Balling Machines, Reels,
Banding Machines
Mirror Spinning Rings
(Trade-Mark Reg. U. S. Pat.



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Rabbeth Centrifugal Clutch Spindles
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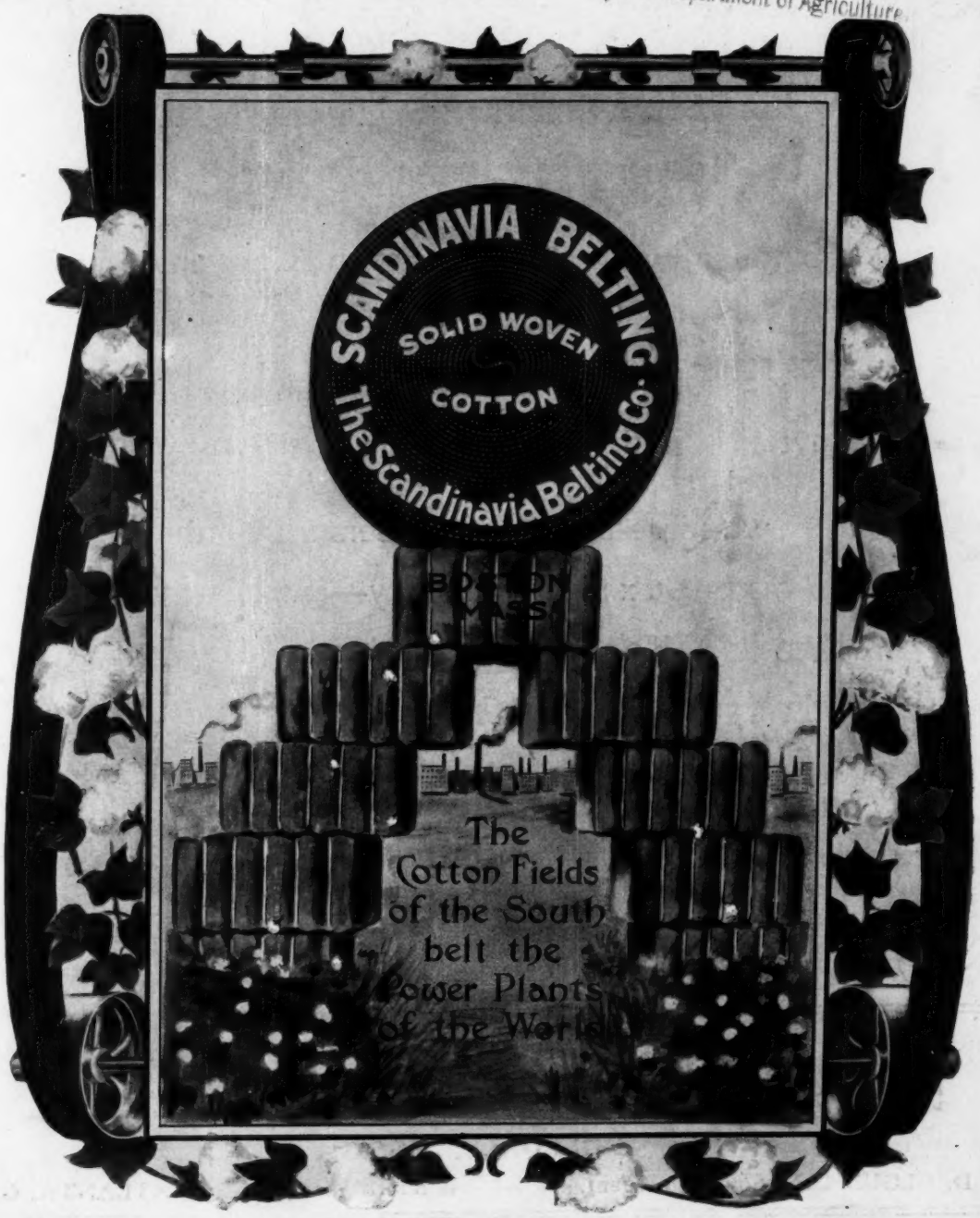

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IT PAYS TO USE NORTHROP LOOMS

At this Season the Thrifty Housewife cleans House

Coincident with this the cotton mills order machinery for replacement of what the housecleaning process shows too antiquated for anything but the foundry cupola

May we suggest that early orders for Northrop Looms are taxing our capacity—and that **we have but little space** for additional orders **for delivery prior to December 1st.**

DRAPER COMPANY

HOPEDALE, MASS.

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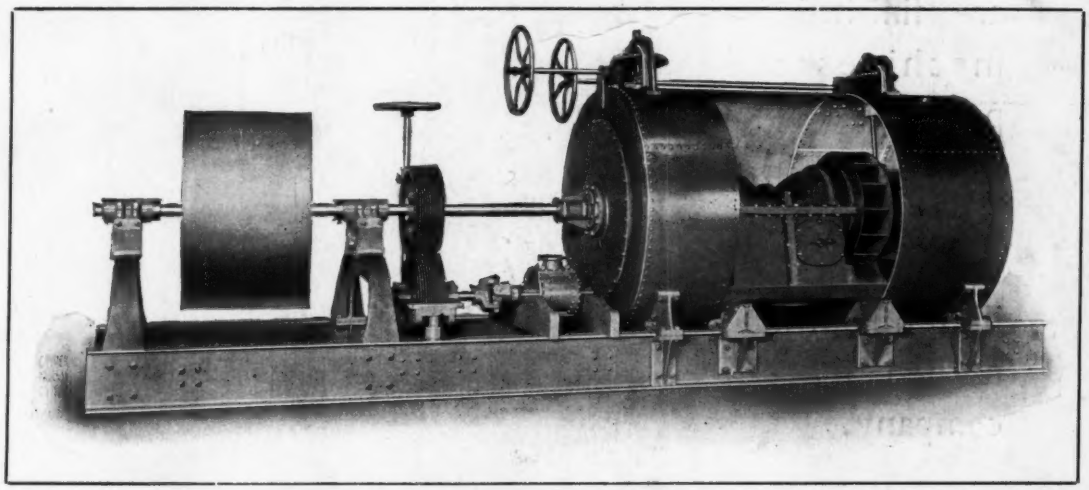

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IF YOU BUY A TURBINE, IT SHOULD SUIT YOUR REQUIREMENTS.
PROPER ENGINEERING CONSIDERATION IS OF PRIME IMPORTANCE.

We have a large list of Turbines not covered by catalogue and are constantly designing and building new Turbines for given powers and speeds. We solicit correspondence. Give us full data available.

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Our MIRROR Spinning Rings

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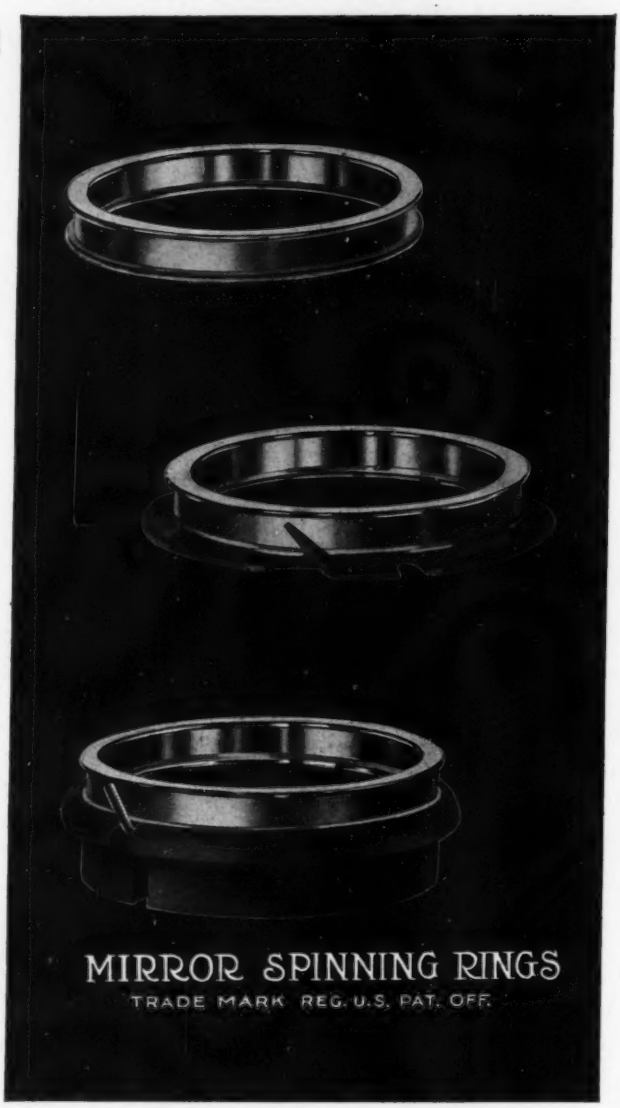
There are none others

"Just as Good"

These Rings are finished by machines and processes invented and patented by Mr. Frank H. Thompson and owned by our company.

In ordering new frames do not forget to insist on



MIRROR Spinning Rings

DRAPER COMPANY

HOPEDALE, MASS.

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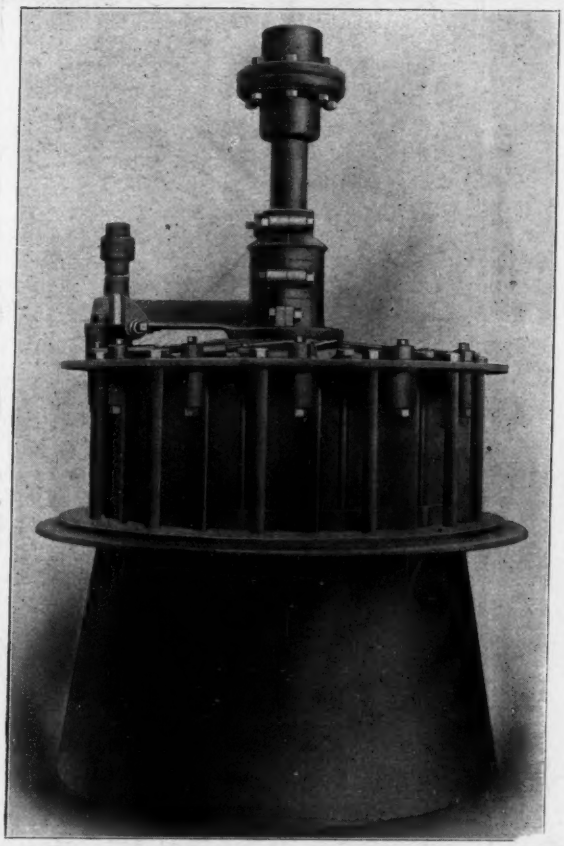

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STRENGTH

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It Develops

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Best Efficiency

If you are interested in the development of a water-power, why not investigate the merits of the SAMSON ?

It is a turbine strictly up-to-date in every particular and one that will save you money.

JAMES LEFFEL & COMPANY

299 LAGONDA STREET SPRINGFIELD, OHIO, U. S. A.

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GETS ALL THE COTTON
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For further detailed information write

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Most convenient in adjustment.

RHOADES-CHANDLER SEPARATORS.

Enable use of larger rings and longer traverse.

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Prevent wear and sticking of rods.

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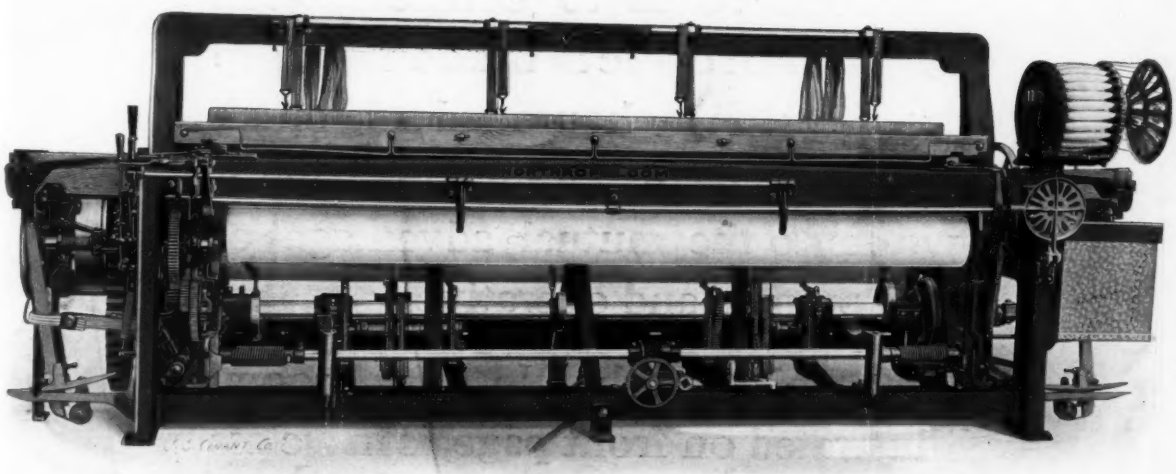

NORTHROP BROAD SHEETING LOOM

IT PAYS TO USE NORTHROP LOOMS

¶ The continued success of the Textile Industry in this country depends upon the adoption of the most improved labor-saving machines so as to compete with foreign products made by help working longer hours and paid much less wages per day. Such machinery works to the mutual advantage of mill owners and operatives.

¶ In this line the Northrop Loom, illustrated on front page, is in a class by itself.

DRAPER COMPANY

HOPEDALE, MASS.

J. D. CLOUDMAN, Southern Agent, 40 South Forsyth Street, ATLANTA, GA.

IT PAYS TO USE NORTHROP LOOMS

Our August shipments of over 2200 Northrop Looms included a distribution among twelve states embracing Maine to California in longitude, and Vermont to Georgia in latitude.

The list by states is as follows:

MAINE	NEW JERSEY
NEW HAMPSHIRE	NORTH CAROLINA
VERMONT	SOUTH CAROLINA
MASSACHUSETTS	GEORGIA
RHODE ISLAND	ALABAMA
CONNECTICUT	CALIFORNIA

NORTHROP LOOMS ARE PRODUCING	
PRINT CLOTHS	DAMASKS
WIDE AND NARROW SHEETINGS	SEAMLESS BAGS
DRILLS	PILLOW TUBING
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JEANS	CORDUROYS
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WORSTED DRESS GOODS	AND VARIOUS FANCY WEAVES

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J. D. CLOUDMAN, Southern Agent, 40 South Forsyth Street, ATLANTA, GA.

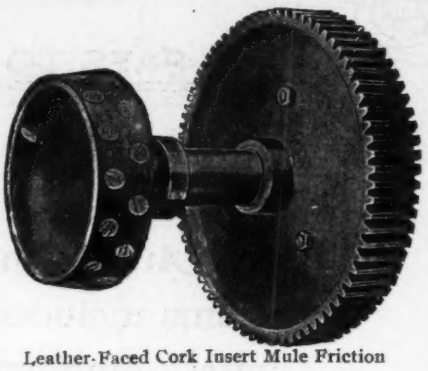
We Equip in our Own Factory Pulleys, Loom and Mule Frictions, Clutches

and many other Frictional Devices

WITH

Cork Inserts

(Patented)



Leather-Faced Cork Insert Mule Friction

Send parts you wish equipped with Cork Inserts by express, prepaid, to the National Brake & Clutch Co.. Lawrence, Mass. They will be given careful attention and returned promptly.

One order now being filled calls for 3000 "Ready-to-Use" Loom Friction Rings.

All sizes of Pulleys equipped with Cork Inserts may be purchased at reasonable prices from the

Fairbanks Company, Boston, New York, Philadelphia and Baltimore
Oneida Steel Pulley Co., Oneida. N.Y.
W. W. Carey Co., Lowell, Mass., and the National Brake & Clutch Co.

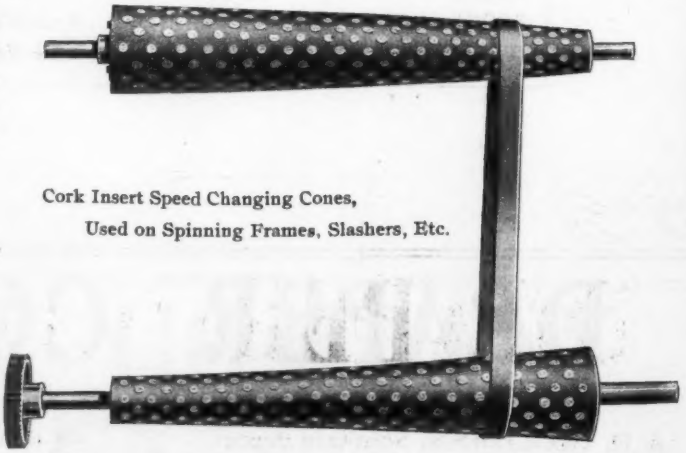
The high efficiency of Cork Insert Pulleys is shown by their use on all kinds of hard drives in Textile Mills and other manufacturing plants where other types of pulleys have failed to do the work. For further proof read the following report.

Power Transmitting Capacity of various types of Pulleys as shown by a series of tests made at the Lowell Textile School, Lowell, Mas .

TYPE OF PULLEY	H. P. at 2% Slip	Maximum H. P.	Slip in % at Maximum	Relative Value
Wood Rim Pulley, WITH CORK INSERTS	11 8	13.2	4.6	100%
Wood Rim Pulley, Leather Lagged	8 7	12 4	4 7	73%
Steel Pulley, Plain	8.3	12 7	6.0	70%
Wood Rim Pulley, Plain	7 8	9 6	4.3	63%

Percentage of Gain of Wood Rim pulley with Cork Inserts over same without the Inserts 51%
Percentage of Gain of Wood Rim pulley with Cork Inserts over plain Steel pulley without the Inserts 42%
Percentage of Gain of Wood Rim pulley with Cork Inserts over Leather Lagged pulley without the Inserts 35%

Send for complete report giving full details of the above test also for reports of tests made at the Worcester Polytechnic Institute on other types of pulleys and a booklet, devoted entirely to the use of Cork Inserts in Textile Mills.



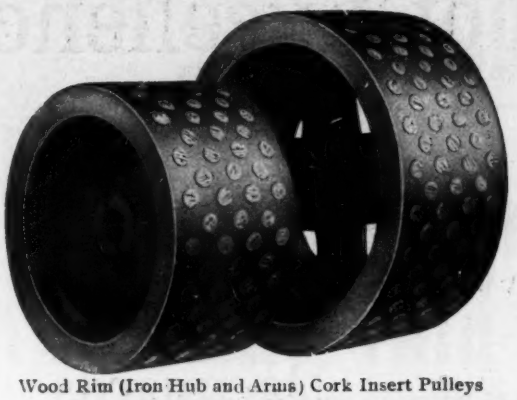
Cork Insert Speed Changing Cones,
Used on Spinning Frames, Slashers, Etc.

We are always glad to give manufacturers the benefit of our experience in successfully and inexpensively solving many difficult power transmission problems.

National Brake & Clutch Co.

DEPT. B

16 State St., Boston



Wood Rim (Iron Hub and Arms) Cork Insert Pulleys

We License Manufacturers

to equip their own

Pulleys, Mules, Cones, Etc.

WITH

Cork Inserts

(Patented)

Such equipment can be made at small expense in their own machine shops—out of regular working hours or at other convenient times.

More than 250 Textile Mills are now using Cork inserts.

Two typical reports from well-known mills are submitted. NOTE THE RANGE OF SIZES.

Gentlemen:-

We give you below a list of pulleys for the royalties due to cover them with Cork Inserts. This is for all the new work done since our last quarterly report:

1	Pulley	62"	dia.	26"	face	35.2	Sq. Ft.	1	Pulley	54" dia.	15" face	17.6	Sq. Ft.
5	"	62"	"	30"	"	202.9	" "	1	"	60" "	25" "	32.7	" "
2	"	36"	"	5"	"	7.8	" "	3	"	44" "	12½" "	35.7	" "
22	"	40"	"	4"	"	76.	" "	1	"	51" "	12½" "	13.9	" "
8	"	40"	"	5"	"	34.4	" "	2	"	44" "	18½" "	35.4	" "
2	"	40"	"	8½"	"	14.8	" "	—				—	
1	"	36"	"	8½"	"	6.6	" "	49				513.	" "

Very truly yours, _____ Co.

Pulleys fitted with Cork Inserts during the last quarter:

1	Pulley	31" x 9"	6.08	Sq. Ft.	4	Pulleys	29" x 10"	25.27	Sq. Ft.
1	"	31" x 11"	7.43	" "	1	"	44¼"x 16"	15.42	" "
1	"	23" x 17"	8.53	" "	1	"	20¼"x 15"	6.61	" "
2	"	36" x 8"	12.56	" "	1	"	48" x 15"	15.70	" "
2	"	48" x 16"	33.51	" "	1	"	52" x 36"	40.84	" "
1	"	48" x 19"	19.89	" "	1	"	48" x 22"	23.03	" "
1	"	48" x 9"	9.42	" "	1	"	48" x 12"	12.56	" "
1	"	51" x 9"	11.12	" "	1	"	40" x 22"	19.19	" "
1	"	50" x 14"	15.27	" "	1	"	40" x 12"	10.47	" "
1	"	43" x 14"	13.13	" "	2	"	48" x 12"	25.13	" "
1	"	81" x 24"	42.41	" "	1	"	24¾"x 18"	9.69	" "
2	"	49" x 16"	34.20	" "	1	"	25½"x 18"	10.01	" "
1	"	40" x 12"	10.47	" "	1	"	22" x 21"	10.07	" "
1	"	40" x 13"	11.34	" "	4	"	48" x 10"	41.88	" "
1	"	30½"x 12"	7.98	" "	2	"	33" x 18"	25.91	" "
1	"	30" x 13"	8.50	" "	2	"	48" x 18"	37.69	" "
1	"	28" x 11"	6.71	" "	4	"	22" x 11"	21.11	" "
1	"	18" x 13"	5.10	" "	1	"	42" x 18"	16.49	" "
1	"	48" x 13"	13.61	" "	16	"	23" x 5"	40.12	" "
1	"	48" x 16"	16.75	" "	—			—	
2	"	25" x 10"	10.90	" "	73		Total	738.23	" "
2	"	54" x 11"	25.93	" "					

_____ Co.

Fig. 1. Iron Pulley with Wooden Backing Strips

An inexpensive method of applying Cork Inserts to Spinning and Twisting Frame Pulleys now in use.

Fig. 2. Assembled, equipped with Cork Inserts

CORK INSERTS eliminate belt slip and give constant power with much less belt tension.

CORK INSERTS keep your machines up to their capacity at all times and reduce your fuel, belting and repair bills.

Write for booklets showing 90 applications or ask to have our representative call with models showing how cork Inserts can be easily and inexpensively applied to existing equipment.

National Brake & Clutch Co.

DEPT. B.

16 State St., Boston

High Standard of Excellence

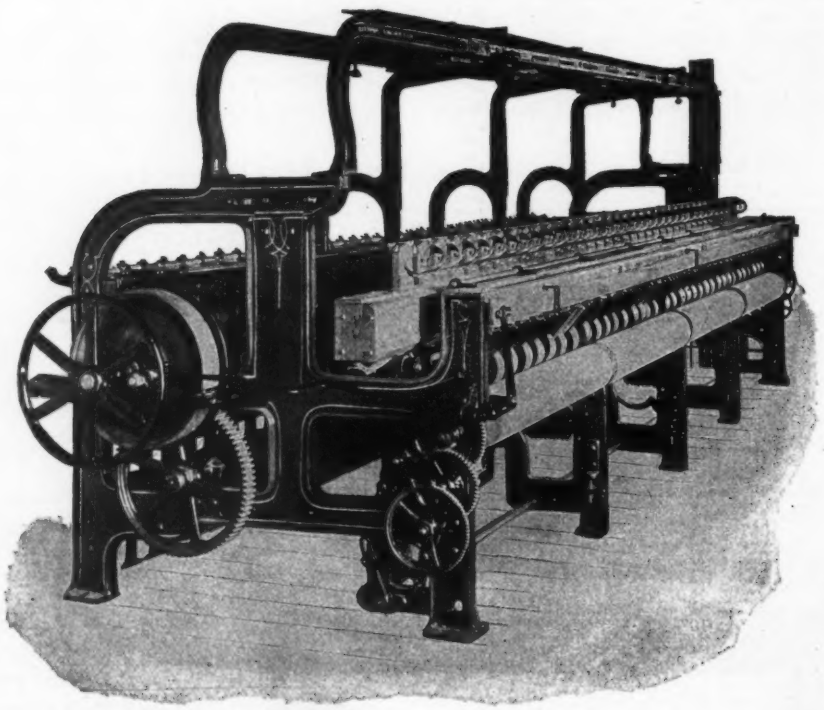
In Weaving Machinery

Cotton Looms in Six New Models for Plain and Fancy Weaving

Damask Looms :: Jacquards

PATTEN'S IMPROVED DOBBY

LOOM SUPPLIES



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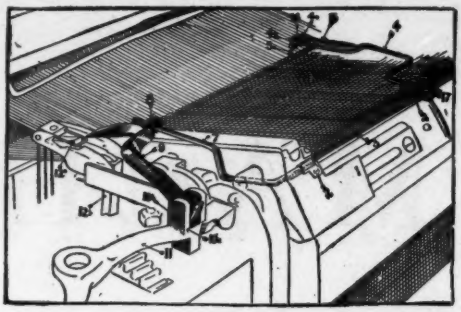


69 Cotton Mills

USING THE

CLAYTON & BENTLEY

Automatic Thin Place Preventer

On their automatic looms and making AN ANNUAL PROFIT OF 100 PER CENT. on the cost of applying at $2.00 and $2.25 per loom. Is your name on the list. If not, why not?

.... SOUTHERN MILLS ....

Abbeville Cotton Mills,	Abbeville, S. C.	Complete. 940
Arcadia Mills,	Spartanburg, S. C.	Complete, 345
Belton Mills,	Belton, S. C.	1st order 200, 2d order 613
Brookside Mills,	Knoxville, Tenn.	1st order 200
Columbia Mfg. Company	Ramseur, N. C.	Complete
Columbus Mfg. Company	Columbus, Ga.	Complete, 784
Cowpens Mfg. Company,	Cowpens, S. C.	Complete
Dallas Mfg. Company,	Huntsville, Ala.	1st order, 441
Darlington Cotton Mills,	Darlington, S. C.	1st order
Dwight Mfg. Company,	Alabama City, Ala.	Complete, 600
Easley Cotton Mills,	Easley, S. C.	1st order
Exposition Cotton Mills,	Atlanta, Ga.	Complete, 350
Erwin Cotton Mills Company,	West Durham N. C.	1st order
Fairfield Cotton Mills,	Winnsboro, S. C.	1st order
Gainesville Cotton Mills,	Gainesville, Ga.	1st order
Glen Raven Cotton Mills,	Burlington, N. C.	Complete
Granby Cotton Mills,	Columbia, S. C.	1st order
Harmony Grove Mills,	Commerce, Ga.	Have placed 2d order
Hartsville Cotton Mills,	Hartsville, S. C.	Have placed 3d order
Henderson Cotton Mills,	Henderson, N. C.	Complete
Home Cotton Mills,	St. Louis, Mo.	Complete, 674
Jackson Fibre Company,	Bemis Tenn.	1st order 200, 2d order 612
John P. King Mfg. Company,	Augusta, Ga.	Complete, 1,600 Looms
Lanet Cotton Mills,	West Point, Ga.	Have placed 2d order
Lockhart Cotton Mills,	Lockhart, S. C.	1st order
Loray Mills,	Gastonia, N. C.	1st order
Mass. Mills in Georgia,	Lindale, Ga.	4th order, total 1812
Meridian Cotton Mills,	Meridian, Miss.	Complete
Merrimack Mfg. Co.,	Huntsville, Ala.	1st order
Monaghan Mills,	Greenville, S. C.	Complete, 1,260 Looms
Neuse River Mills,	Raleigh, N. C.	Complete
Olympia Cotton Mills,	Columbia, S. C.	3d order, total 1 650
Orr Cotton Mills,	Anderson, S. C.	2d order, total 700
Ossippee Cotton Mills,	Burlington, N. C.	Complete, single and double
Pacolet Mfg. Company,	New Holland, Ga.	4th order, total 1,424
Pacolet Mfg. Company,	Spartanburg, S. C.	Complete, 942 Looms
Palmetto Cotton Mills,	Palmetto, Ga.	Complete
Pell City Mfg. Co.	Pell City, Ala.	Complete, 620
Piedmont Mfg. Company,	Piedmont, S. C.	1st order 640
Pilot Cotton Mills,	Raleigh, N. C.	Complete
Roanoke Mills Co.,	Roanoke Rapids, N. C.	Complete
Royall Cotton Mills,	Wake Forest, N. C.	Complete
Saxon Mills,	Spartanburg, S. C.	Have placed 2d order
Spartan Mills,	Spartanburg, S. C.	Have placed 2d order
Pelzer Mfg. Company No. 1,	Pelzer, S. C.	Complete
" " " " 2,	" "	"
" " " " 3,	" "	"
" " " " 4;	" "	2,876 Looms, including 919 Double Fork Looms
Tarboro Cotton Factory,	Tarboro, N. C.	1st order
Textile Mills Corporation,	New Orleans, La.	1st order
Thomaston Cotton Mills,	Thomaston, Ga.	1st order
Trion Mfg. Co.,	Trion, Ga.	2d order
Tucapau Mills,	Tucapau, S. C.	Have placed 2d order
Victor Mfg. Company,	Greers, S. C.	3d order, total 725
Ware Shoals Mfg. Company,	Ware Shoals, S. C.	Complete, 1,400
Whitney Mfg. Company,	Spartanburg, S. C.	2d order 416
Woodruff Cotton Mills,	Woodruff, S. C.	3d order 628
Worth Mfg. Company.	Worthville, N. C.	1st order 160

Also ELEVEN Large Mills in NEW ENGLAND and CANADA.

——MANUFACTURED BY——

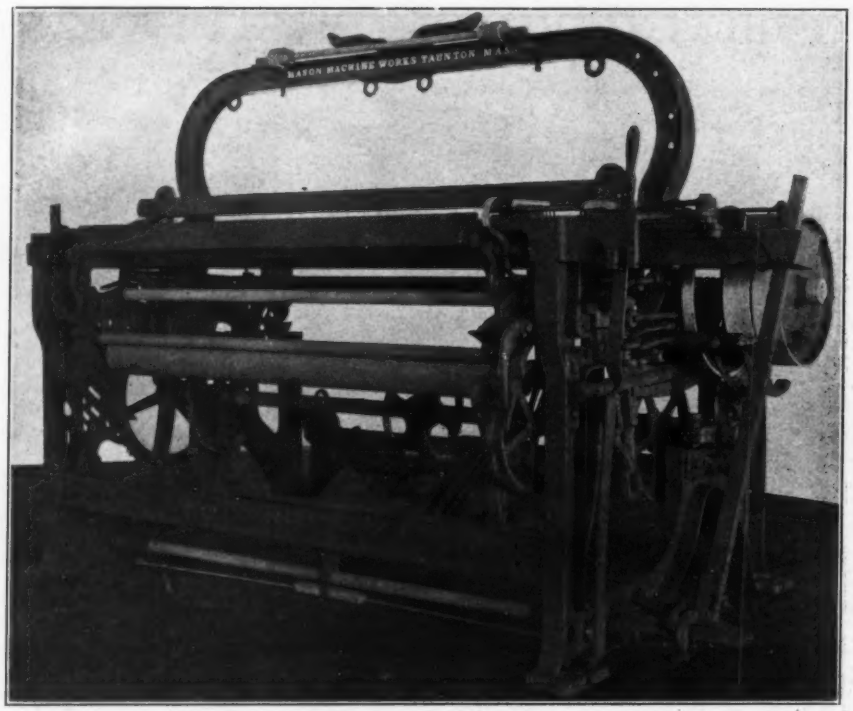
CLAYTON & BENTLEY CO.

ATLANTA, GEORGIA.

FIRST
MASON POWER LOOM
1829

MASON MACH

TAUNTON,
MASSACHUSETTS



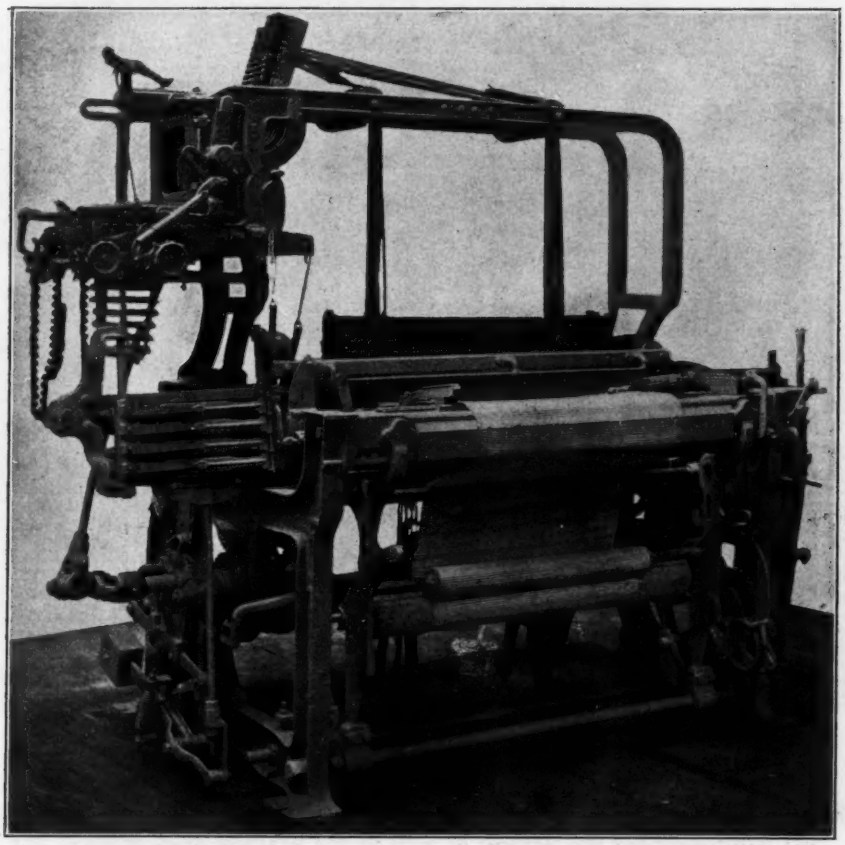
Standard Sheeting Loom

CARDS,
DRAWING,
SPINNING,
MULES, LOOMS,

LATEST
MODERN POWER LOOMS
1909.

INE WORKS

INCORPORATED
1873.



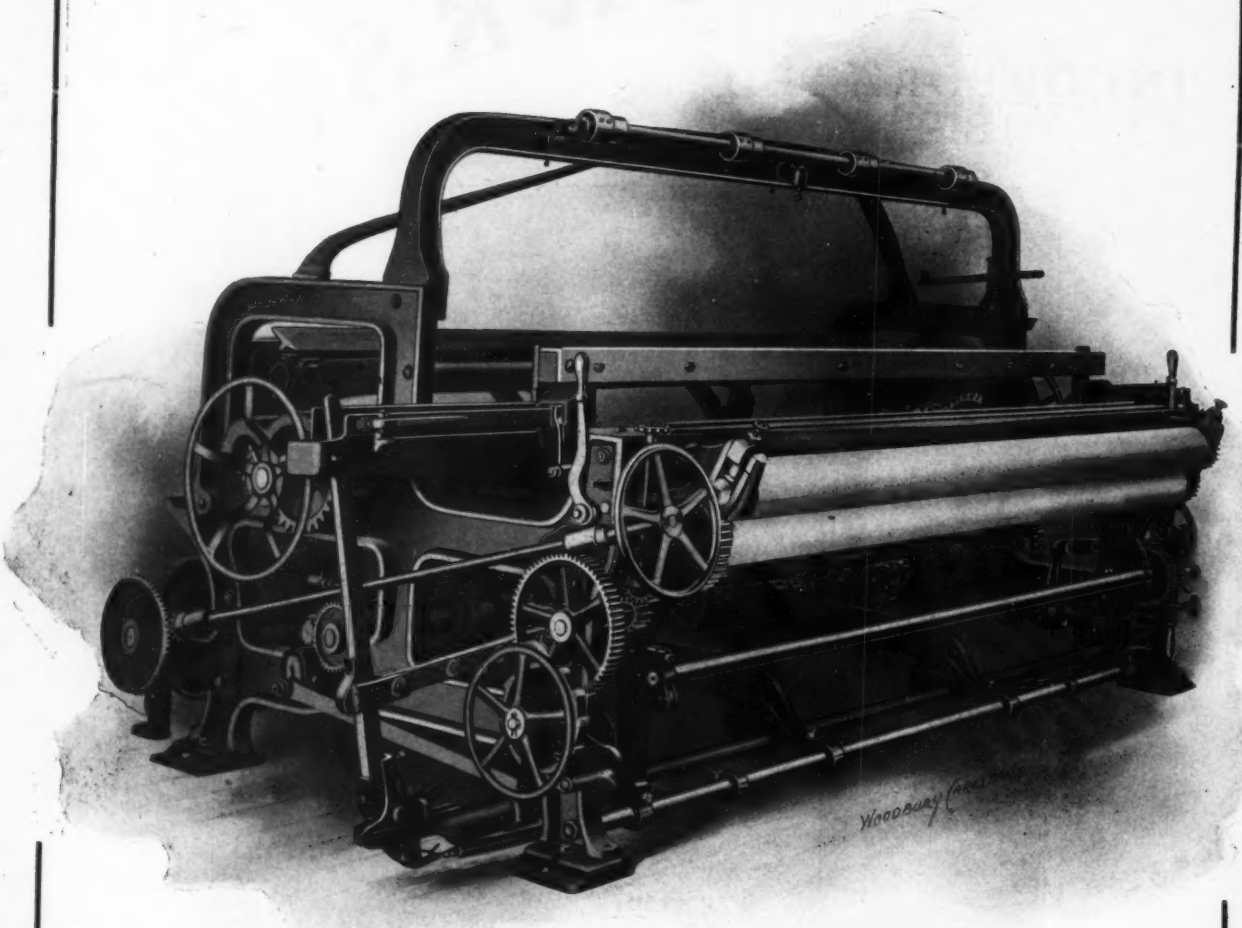
Fancy Loom with Mason Dobby.

Southern Office at Charlotte, N. C.

Address:

MASON MACHINE WORKS
EDWIN HOWARD, AGENT
Charlotte, N. C.

Recommended For All Weights of Duck



Turning Out Properly Made Cotton Duck is a simple matter with the Crompton & Knowles Duck Loom. We build them for the lightest as well as the heaviest duck made. The heavy style shown here gives a fair idea of its strength and rigidity, always necessary in a loom for weaving first-class duck, sail cloth or canvas. We make several styles much heavier than this, as well as looms of a lighter construction. Built by the makers of looms for every fabric.

Crompton & Knowles Loom Works.

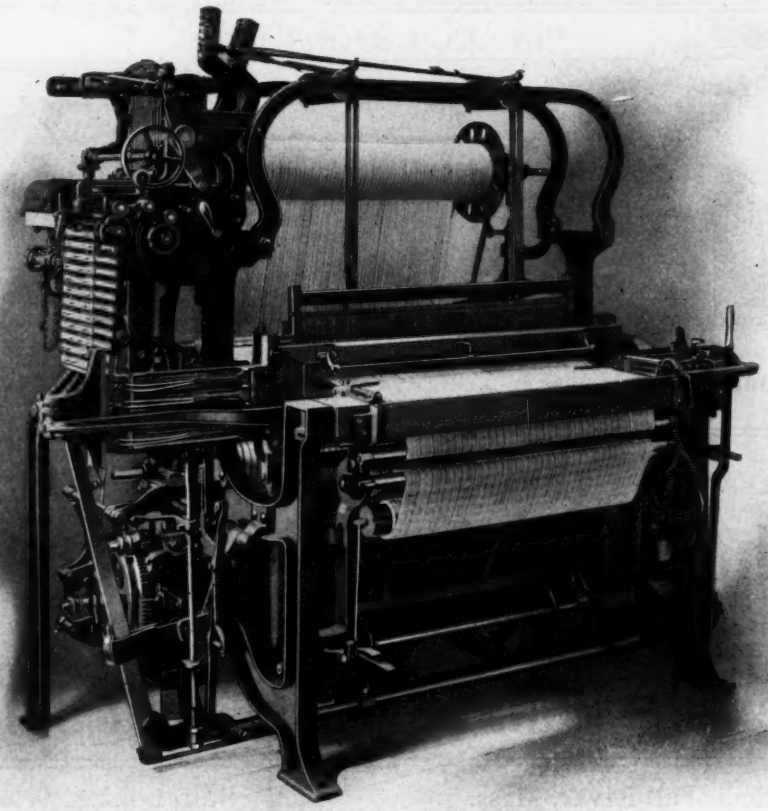
WORCESTER, MASS. PROVIDENCE, R. I. PHILADELPHIA, PA.

ALEXANDER & GARSED, Charlotte, N. C., Southern Agents.

Looms of Proven Worth

And Reliability for Everything in

Cotton Goods



First Class Material and First Class Workmen Combine in Maintaining the Crompton & Knowles Standard of EXCELLENCE in every Loom we build. It's the same with Our Dobbies, Jacquards and Supplies.

SEND FOR CATALOGUES

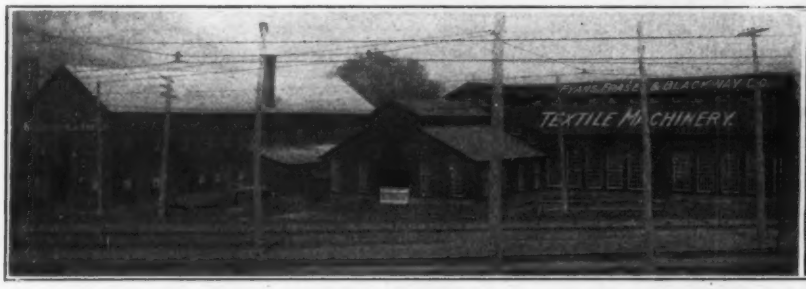
Crompton & Knowles Loom Works,

WORCESTER, MASS., PROVIDENCE, R. I., PHILADELPHIA, PA.

ALEXANDER & GARSED, Charlotte, N. C., Southern Agents.

Fyans, Fraser & Blackway Company

Fall River, Mass.



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Largest Dealers in

Second-Hand Textile Machinery

in the United States of America

Textile Plants Bought and Sold

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Loom Crank Shafts Made for all Styles of Looms.
Flyers and Pressers Made and Repaired.
Fluted Steel Rolls Renecked and Refluted and Made as Good as New.
25 Tons of Shafting of all Sizes Constantly on Hand.

Power Transmission a Specialty

LOWELL MACHINE SHOP, LOWELL, MASS.

BUILDERS OF

COTTON MILL MACHINERY

OUR LOOMS INCLUDE

Heavy Duck Looms, Light Duck Looms,
Special Flat Duck Looms,
Press Cloth Looms,
Dobby Looms, Drop Box Looms,
Jacquard Looms, Silk Looms,

WE FURNISH

Looms Complete with the Leading
Makes of Dobbies, Jacquards,
Warp Stop Motions, Terry and
Special Motions Required
for a Large Variety of Fabrics.

ALSO LOOMS WITH

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COMPLETE TEXTILE EQUIPMENTS

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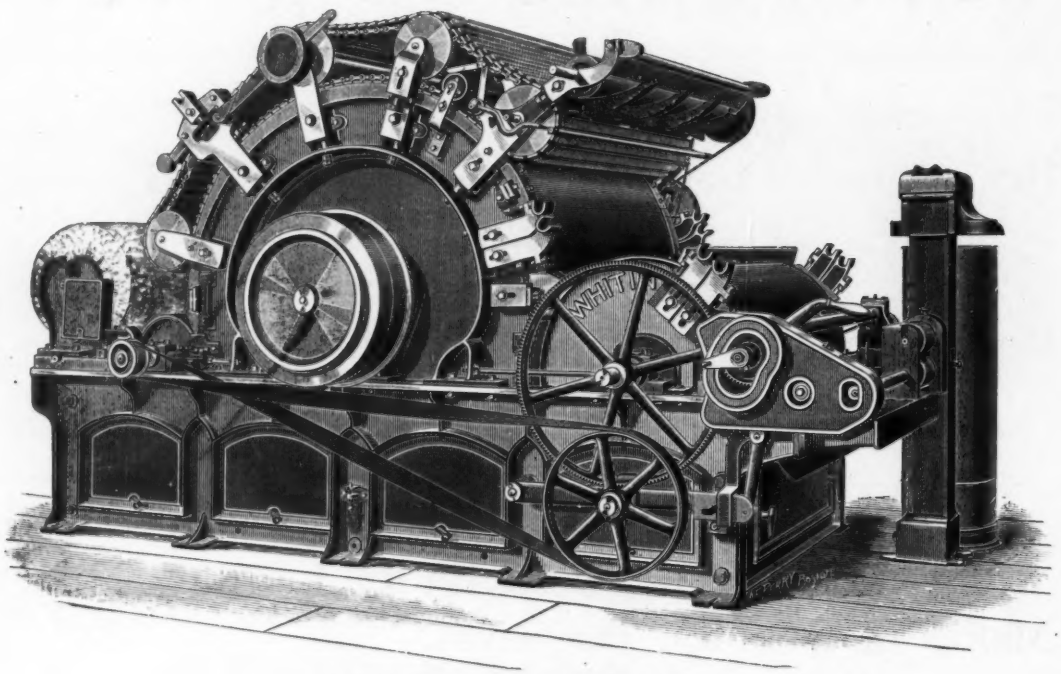
JOHN HILL, Southern Representative

THE WHITIN MACHINE WORKS,

Whitinsville, Mass.



REVOLVING FLAT CARD

BUILDERS OF

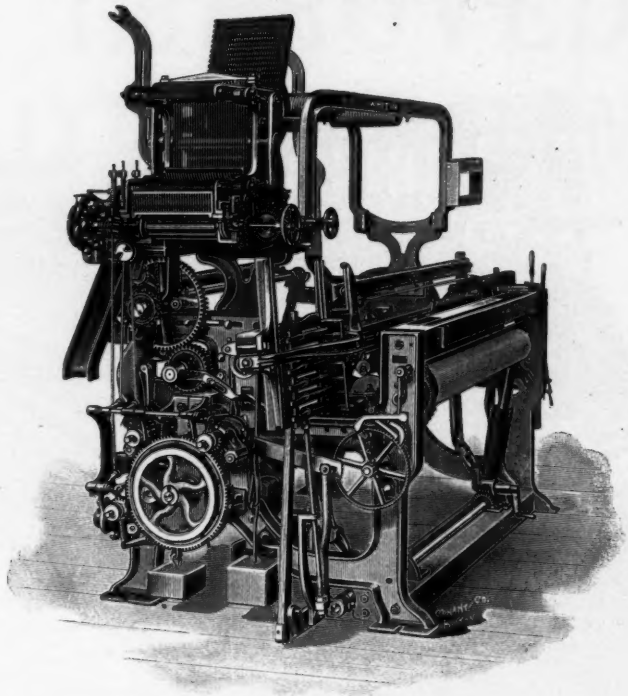
Cotton Machinery,

Cards, Sliver Lap Machines, Ribbon Lap Machines, Combers, Drawing Frames, Spinning Frames, Spoolers, Twisters, Reels, Long Chain Quillers, and Looms.

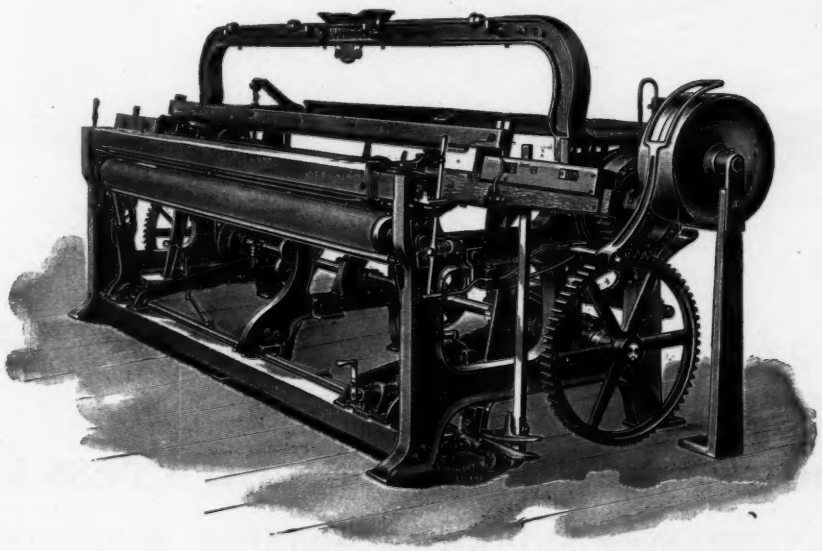
Southern Agent: **STUART W. CRAMER, Charlotte, N. C., and Atlanta, Ga.**

THE WHITIN MACHINE WORKS,

Whitinsville, Mass.



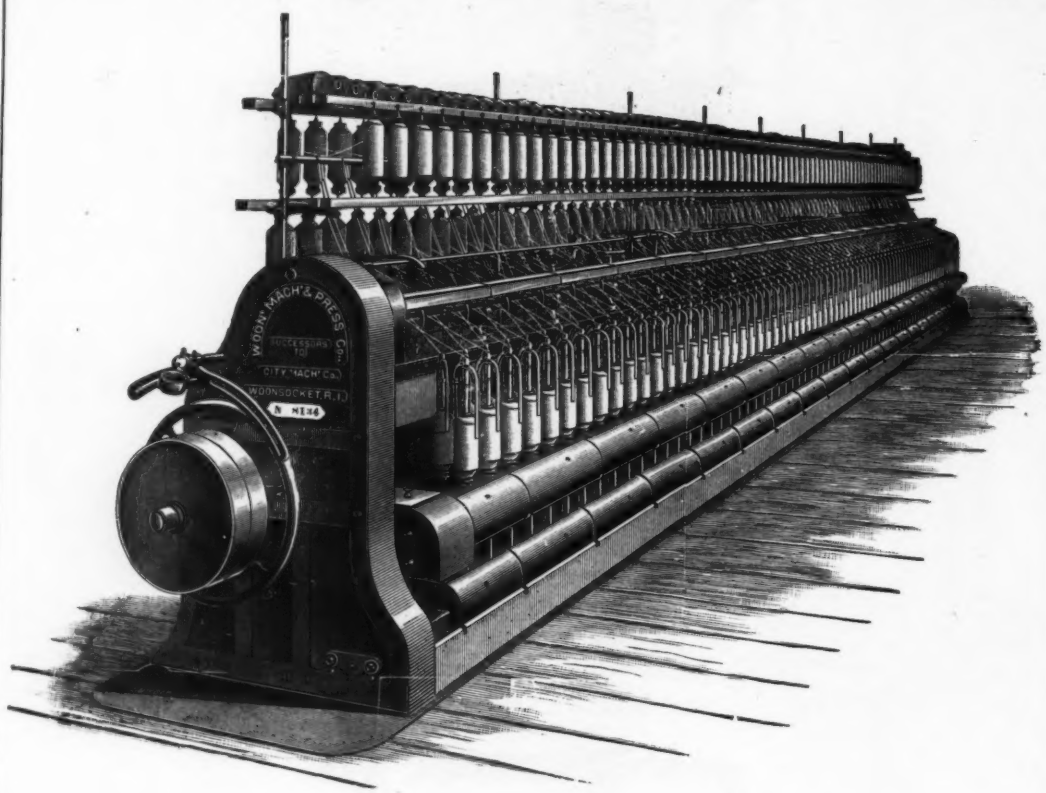
SIX BOX FANCY LOOM.



WIDE LOOM.

Southern Agent: STUART W. CRAMER, Charlotte, N. C., and Atlanta, Ga.

Roving Machinery



S eeder

Ball-Bearing Top Roll

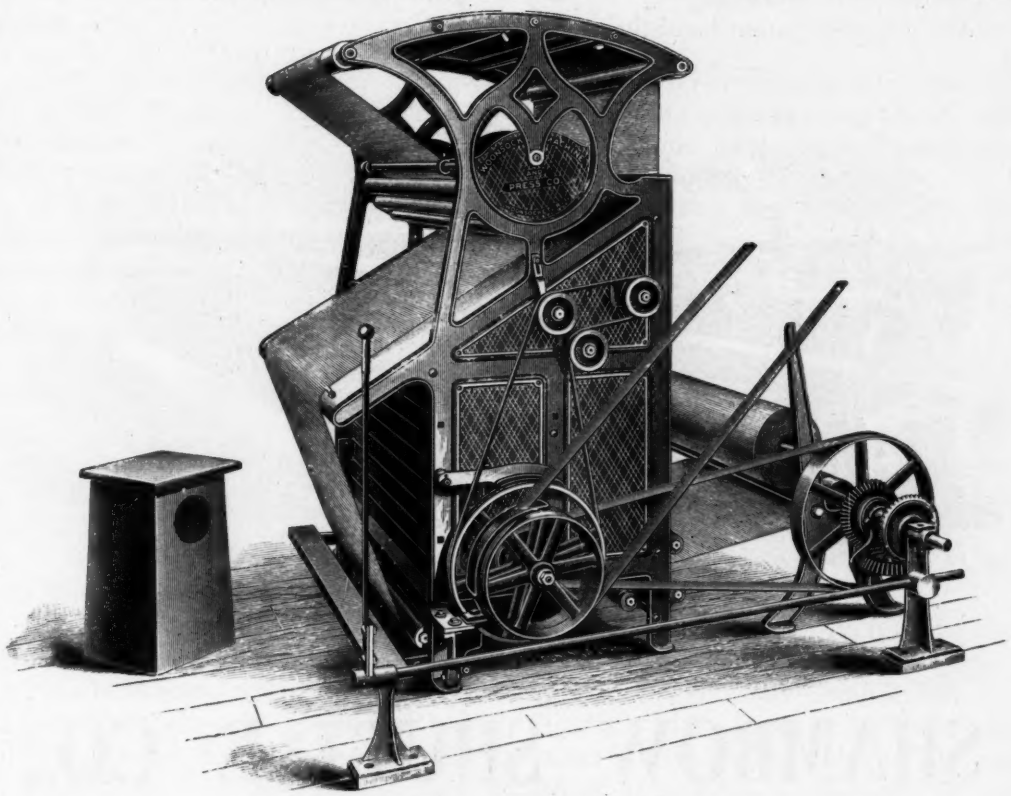
Drawing Frame

Woonsocket Machine and Press Co.,

WOONSOCKET, RHODE ISLAND, U. S. A.

STUART W. CRAMER, Southern Agent, CHARLOTTE, N. C.

IMPROVED CLOTH TRIMMER



MANUFACTURED BY

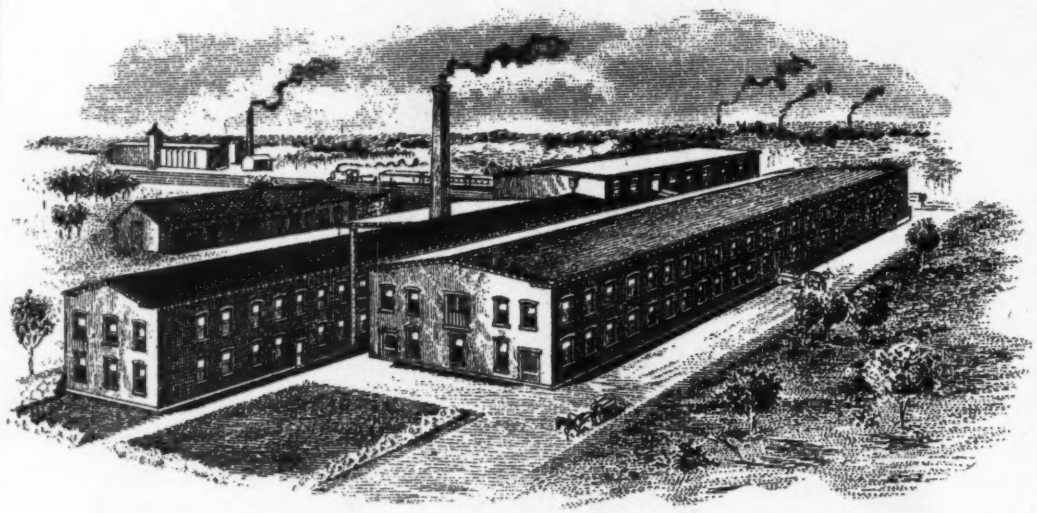
Woonsocket Machine and Press Co.,

WOONSOCKET, RHODE ISLAND, U. S. A.

STUART W. CRAMER, Southern Agent, CHARLOTTE, N. C.

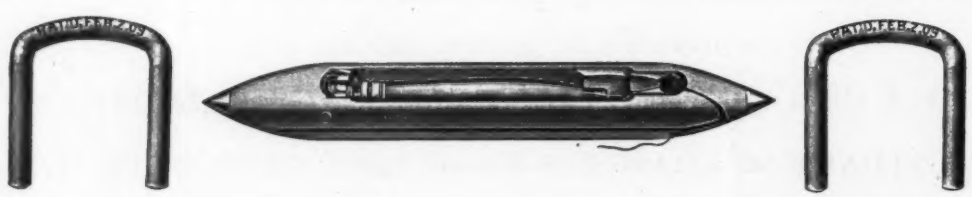
Our patent staple (illustrated on this page) is used in connection with the Marble Spindle and prevents the wood from splitting when spindle is raised.

Also note our patent hand-threading device.



SHAMBOW SHUTTLE CO.,

Woonsocket, R. I.



"C. & G."

Warp-Stop-Motions

Improve your "firsts," reduce your "seconds" and make largest possible saving in weaving cost by adding "C. & G." Warp Stop Motion to your looms.

Ten of the leading mills in New England have every loom fitted with the "C. & G." Motion. These looms are weaving the coarsest and finest yarns and sleys up to 120's single cotton and 200 threads per inch. All with absolutely the same design of motion.

The most unskilled weavers operate twelve looms and upwards on plain cottons maintaining and in some cases increasing product per loom. The "firsts" are immeasurably improved. "Seconds" are reduced to the minimum and saving in weaving cost is made up to 35%. This is accomplished while the skill required at the loom is largely reduced.

The total cost of the device is earned by saving made in weaving cost, in some cases, in twelve months' time—not including the gains made by improvement in quality.

The motion is equally well adapted to jacquard, dobby and plain weaves.

It gives the largest measure of assistance to the weaver of any Warp Stop Motion yet devised.

It is the most simple and yet the most efficient and widely available Warp Stop Motion ever designed.

Six years' operation of many thousands of motions have proved the maintenance cost to be practically nothing.

Pick-outs and imperfections due to warp faults practically eliminated.

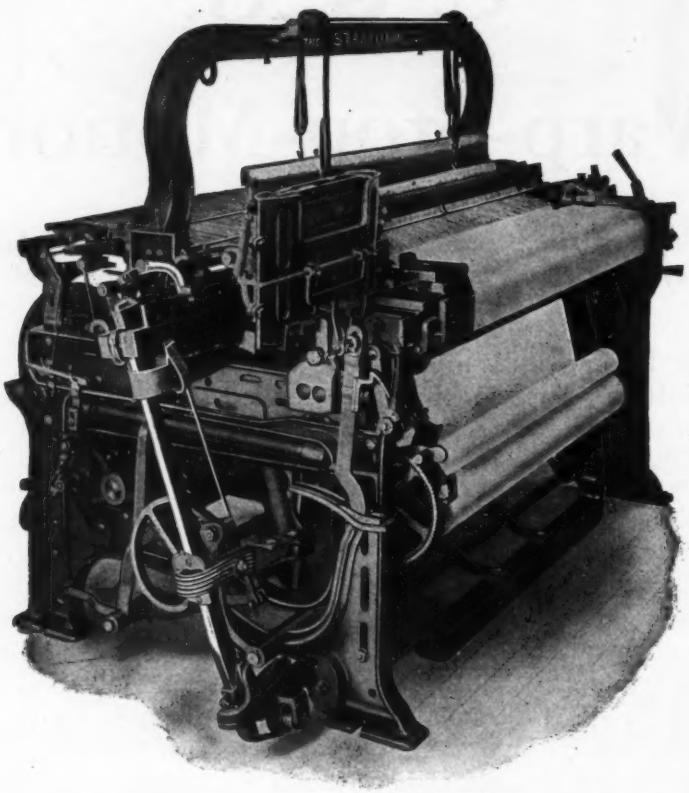
Complete absence of moving parts, together with simple and strong construction, with one design of motion to cover all classes of weaves and one source of power for operating many hundreds of motions, guarantees the utmost efficiency.

The Charlotte Supply Co , Charlotte, N. C., U. S. A., Southern Agents.

THE COLDWELL-GILDARD CO.

Fall River, Mass., U. S. A.

"IDEAL" AUTOMATIC LOOM



THOUSANDS IN SUCCESSFUL OPERATION

A few points worth noting

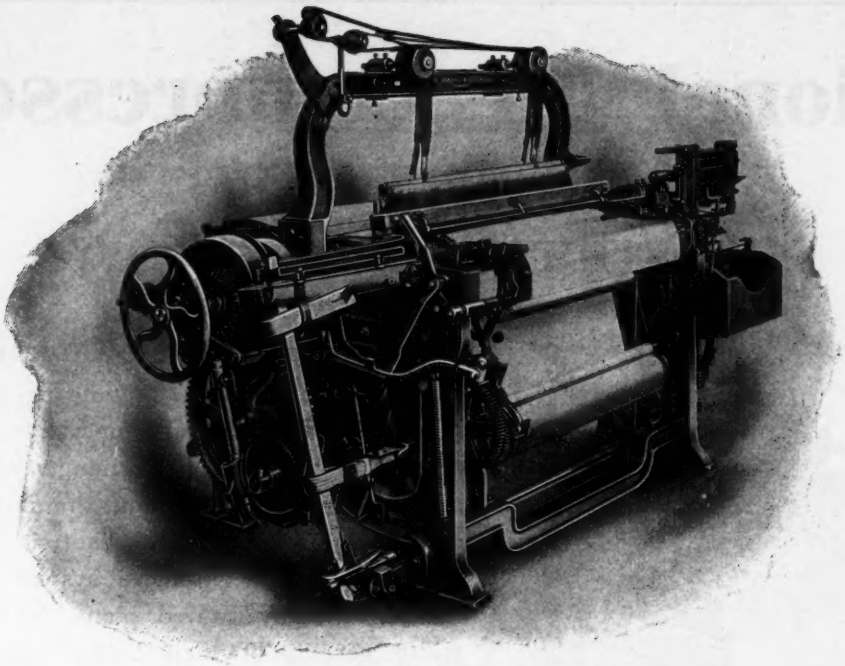
High Quality of Goods.
High Percentage of Production.
Cop or Bobbin Filling.
No Special Supplies.
Freedom from Immoderate Breakages.
No Excessive Fixing.
Ease in Starting Up.

Measured by Results The "Ideal" Automatic Loom Stands Supreme

THE STAFFORD COMPANY

READVILLE, MASS.

FRED M. WHITE, Southern Agent, 1100 Reality Building, Charlotte, N. C.



DRILL LOOM WITH PICK-FINDER

UNEQUALLED FOR SIMPLICITY, EFFICIENCY AND DURABILITY.

Weaves a Higher Grade of Cloth
than any other Loom, Makes . .
less waste, uses less Supplies, . .
Weaves a Wider Range. . . . . .

THE STAFFORD COMPANY

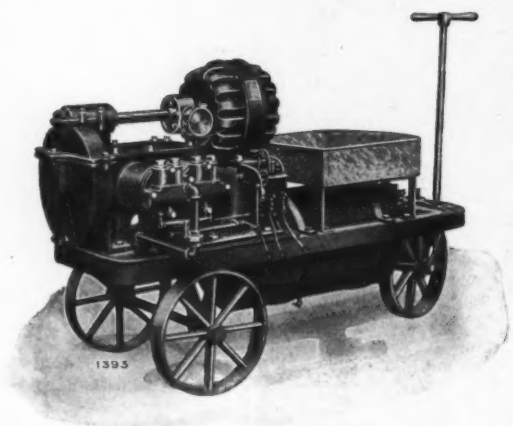
READVILLE, MASS.

FRED M. WHITE, Southern Agent, 1100 Realty Building, Charlotte, N. C.

National Air Compressors

for

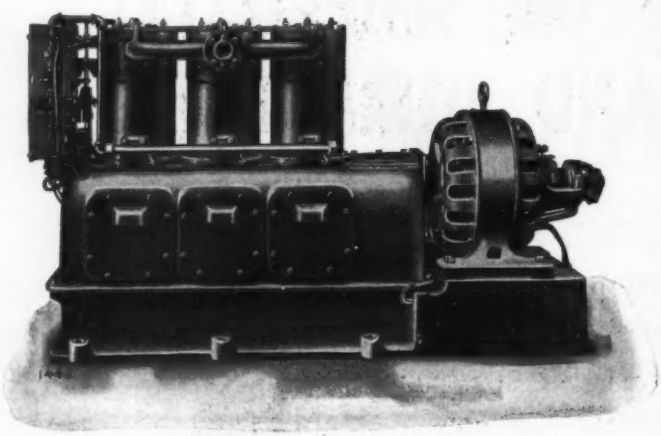
TEXTILE MILLS



ational "A-4" (16 cu. ft.) Portable Air Compressor with Al
N ternating Current Motor and Manually Operated Unloader.

"National" Portable Compressor

outfits are especially adapted for service in textile mills for cleaning looms and other machinery as well as for performing various industrial operations in and about the mill. These outfits will be found useful where it is not desired to install an extensive system of piping from a centrally located plant. Their small width permits of their being taken through narrow aisles and small openings. Furnished in six sizes in capacities of from eleven to fifty cubic feet of free air per minute and equipped with either direct or alternating current motors.



150 Cu. Ft. Type "3VS" Compressor with Alternating Current Motor and Combined Automatic Controlling Apparatus.

Type "3VS" Compressors

are of the single stage type, are very compact and are built to stand hard service and usage. Either direct or alternating current motors can be furnished to operate same. Automatic controlling device, which embodies automatic starter, unloading device and water governor, can be furnished with these compressors. This controlling device is positive and reliable in action and permits of operating the compressors without requiring the presence of skilled attendants, thus effecting a considerable saving. Type "3VS" compressors are built in capacities of 50, 100, 150, and 225 cu. ft. of free air per minute.

WRITE FOR PUBLICATION NO. 38B DESCRIBING ALL TYPES OF "NATIONAL" AIR COMPRESSORS

National Brake & Electric Company

MILWAUKEE, U. S. A.

New York: 111 Broadway
Boston: F. E. Huntress, 131 State St.
Philadelphia: W. H. Goble, 1722 Westmoreland St.
Chicago, 1344 First National Bank Bldg.

FOR EVERY HOISTING NEED

where steam, water or electrical power is either too costly or not to be had at all, there is an

OTIS HAND-POWER ELEVATOR

Installation--at smallest cost.
Maintenance--most economical.
Operation---greatest simplicity and ease.

STORE, FACTORY, WAREHOUSE and STABLE ELEVATORS

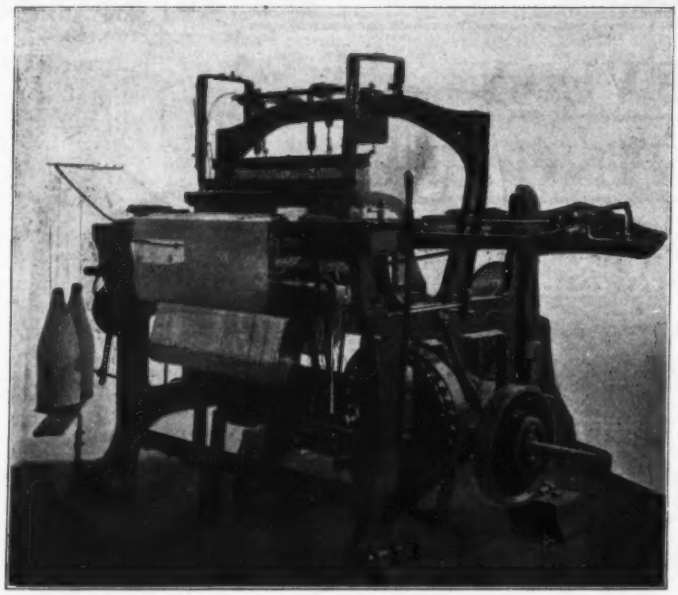
Capacity as high as 2,500 lbs. Made amply strong to cover widest margin of safety. Equipped with every Modern Safety Device. Covered fully by the Otis guarantee.

Send for CATALOGUE C-15

OTIS ELEVATOR COMPANY

Offices in all the Principal Cities of the World

TAVELLA SHUTTLELESS LOOM



THE LOOM OF THE 20th CENTURY

No more Bobbins!
No more Shuttles!
No more "Shuttlesmashes" to damage the cloth.

The Loom that can be adapted to all kind of weaving from fine Cottons to the coarsest fabrics.

Write for descriptive circular and booklet to the

TAVELLA SHUTTLELESS LOOM CO.
53 State St. Room 625. BOSTON, MASS.

OUR LATEST INVENTION

Especially designed for the Pick Arm, shackle or stirrup end. Will wear for years. Note the perfect fit of the stirrup casting in the cancave plug, which gives a greater bearing for the picking motion.

Can not break out, for all the strain, wear and pull comes on the plug, which will wear for years.

Guaranteed to outwear any lug strap made and give satisfaction.

Price 16c each. Free samples to anyone.

Sold by all the leading Supply Houses.

Jacobs' "Verybest" Lug Strap combined with Jacobs' Pick Arm Strap.

Jacobs' "VERYBEST" Lug Strap
PAT. APRIL 9TH 1907
TRADE MARK REGISTERED
APPROVED AND USED BY
THE LARGEST COTTON AND WOOLEN MILLS.

REVISED PRICE LIST.

1¼ in. or 1½ in. wide.		1¾ in. or 2 in. wide.	
8 in.	16c	8 in.	20c
9 "	18c	9 "	22c
10 "	19c	10 "	22c
11 "	20c	11 "	25c
12 "	20c	12 "	25c
13 "	20c	13 "	25c
14 "	20c	14 "	25c
15 "	20c	15 "	30c
16 "	22c	16 "	30c
18 "	25c	18 "	30c

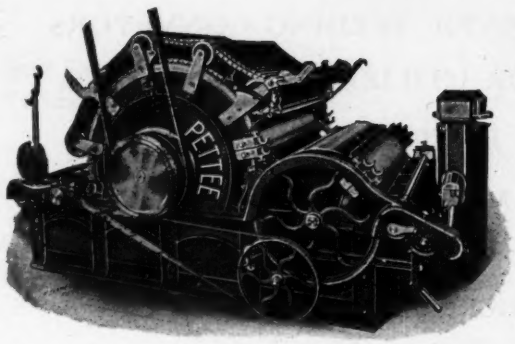
E. H. JACOBS MFG. CO.,

DANIELSON, CONN.

SACO & PETTEE

MACHINE SHOPS

NEWTON UPPER FALLS, MASS.



Cotton Machinery

OF THE MOST

Improved Patterns

WORKS AT

BIDDEFORD, ME. AND NEWTON UPPER FALLS, MASS.

SOUTHERN OFFICE: : CHARLOTTE, N. C.

A. H. WASHBURN, Agent.

USERS KNOW THAT OUR

Self-Balanced Rail Speeder

SAVES MONEY AND MAKES MONEY

Ask Any User

PROVIDENCE MACHINE CO.

PROVIDENCE, R. I.

OCTOBER BULLETIN

¶ Time and energy saved in cleaning—No weights, chains, studs and pulleys to be in the way or to be tended.

¶ Parts to be oiled, grouped together.

¶ Nearly twice as long as most others, nearly twice the number of spindles, uses about one-half the power required for other speeders and produces about twice the quantity of work of equal and Superior quality.

¶ Much less repair and maintenance cost.

¶ Small help in mill can reach creels, means reduced operating cost. Operating and maintenance costs lower than ordinary—quantity and quality of work produced, higher than ordinary.

ASK ANY USER WE'LL TELL YOU WHERE THEY ARE

KITSON MACHINE SHOP

LOWELL, MASS.

COTTON OPENERS AND LAPPERS

BLOWING SYSTEMS AND AUTOMATIC FEEDING CONVEYORS.

PREPARATORY MACHINERY FOR UTILIZATION OF WASTE.

RAW STOCK DRYERS.

COMPLETE COTTON PREPARATORY MACHINERY FROM WAREHOUSE TO CARD ROOM.

REPAIR PARTS FURNISHED FOR PICKERS FORMERLY BUILT BY

WHITEHEAD & ATHERTON, Lowell, Mass.
ATHERTON MACHINE CO., Lowell, Mass.
A. T. ATHERTON MACHINE CO., Pawtucket, R. I.

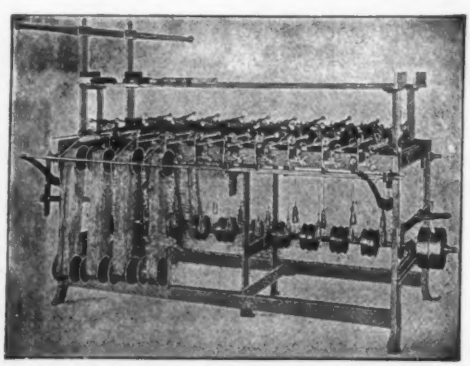
Oswald Lever Company

(FORMERLY LEVER & GRUNDY.)

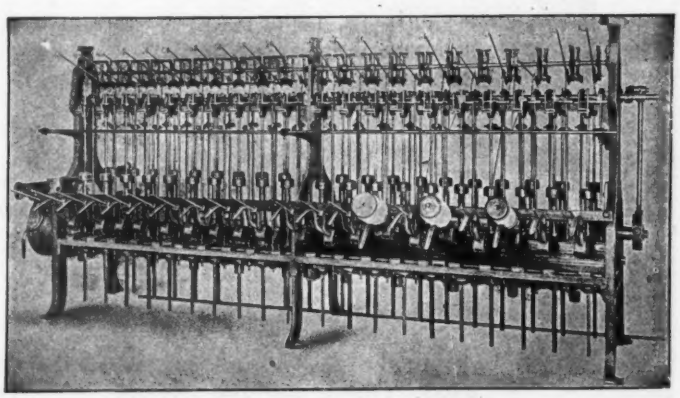
Manufacturers of Textile Machinery and Sole Makers of our Patented Specialties in the United States.

Lehigh Ave. and Mascher Sts., : : PHILADELPHIA, PA., U. S. A.

SOUTHERN AGENTS: STUART W. CRAMER, Charlotte. ALEXANDER & GARSED, Charlotte.



This Machine may be arranged to wind from skeins spools cones or any kind of spinning bobbins. Most suitable machine for cotton blankets.



Vertical Spindle Gear-Driven Winder, as used by all manufacturers of heavy duck jute, cotton bagging and carpets.

Conical and Parallel Tube Winding Machines; Warping Machines and Creels; Brass Bobbin Winding and other Machinery for lace mills; Chenille Cutting Machines, Sectional Warping Mills, Beaming Machines, Etc.

Cop Winding Machines for butts to weave from outside; Filling Bobbin or Quill Winding Machines; Vertical Spindle Spooling Machines for silk, fine cotton, wool and worsted; Variable Speed Bobbin Machines for large bobbins used in knitting mills; Dresser Spooling Machines; Reeling Machines.

Manufacturers Should Look Up the Advantages of the

Metallic Drawing Roll

Over the leather system before placing orders for new machinery, or if contemplating an increase in production, have them applied to their old machinery.

25 TO 33 PER CENT. MORE PRODUCTION GUARANTEED

SAVES:

Roll Covering	Floor Space	Waste and
Varnishing	Power	Wear

ONE-THIRD LESS WEIGHT REQUIRED

RUNS SUCCESSFULLY ON:

Sliver Laps	Comber Draw Boxes	Drawing Frames	Slubbers and
Ribbon Laps	Railway Heads	Mechanical or	Intermediate
		Elec. Stop Motion	Roving Frames

WRITE FOR POINTS CLAIMED, ALSO PRICES AND PARTICULARS, TO

The Metallic Drawing Roll Co.

INDIAN ORCHARD, - - - MASS.

WHITIN RINGS.

LIGHTEST RUNNING
MOST DURABLE, AND
MOST ECONOMICAL.

WHEN YOU'VE SAID "WHITIN RINGS", YOU'VE NAMED THE BEST THERE IS.

While maintaining the HIGHEST POSSIBLE STANDARD OF QUALITY for 35 years, our improved methods of ring making cut the prices in two.

NO SPINNING FRAME OR TWISTER
will do its best work unless equipped with
THE WHITIN RINGS.

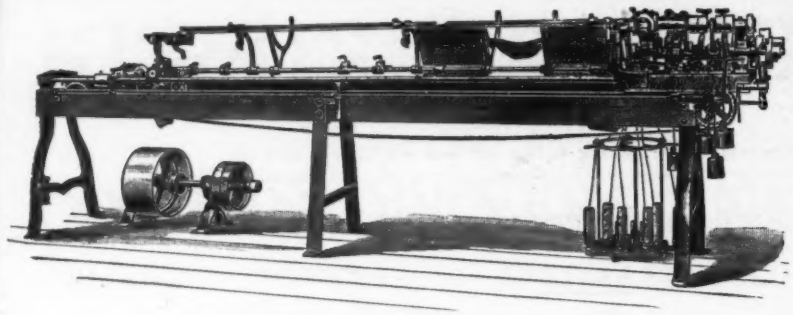
Specify them when ordering Frames from your Machine Builders or send your order direct to us.

WHITINSVILLE SPINNING RING CO.

Makers of the Highest Grade

SPINNING AND TWISTER RINGS, RING HOLDERS, THE U. S. STANDARD TRAVELER CLEANER, AND PATENT TRAVELER CUPS.

WHITINSVILLE, MASS.



NEW IMPROVED MACHINE.

The new improved

Inman Automatic Banding Machine,

Manufactured by

Cole Brothers, - Pawtucket, R. I.

The only automatic machine in the world for making loop bands for spinning frames. Superior quality of bands without any cost of making. All bands exactly alike and no stretch of bands after they are put on. Saves child labor.

Also Beaming Machine to beam on to slasher beams.

A. G. THURSTON & SON

R. W. THURSTON, Proprietor

----- MANUFACTURERS OF -----

Fluted Rolls, Pressers for Flyers and General Machinery

Specialties made of Renecking, Refluting, Filing and Honing of all kinds of Rolls

Speeder flyers repaired and fitted with any style presser

Spindles Straightened, Restepped and Retopped.

Cor. Mulberry and Division Sts., Fall River, Mass.

COLLINS BROS. MACHINE CO.

PAWTUCKET, R. I.

Manufacturers of

RING TWISTERS

All lengths and sizes of rings.

PATENT TRAP TWISTERS

For worsted yarns. Over 11000 spindles running in one mill.

PATENT TRAP DRUM DOUBLERS

for 2 to 4-ply yarns.

DRUM SKEIN WINDERS

ALL MACHINES GUARANTEED

For Quality and Quantity of Yarn Turned off.

A. H. WASHBURN,

Southern Selling Agent

CHARLOTTE, N. C.

Reels for Cotton

WOOLEN AND WORSTED

Patented Hosiery Winders, Cop Winders and Spoolers

Lindsay, Hyde & Co.

2124 to 2130 E. York Street

Philadelphia, Pennsylvania

WATSON'S WIRE Heddles

For weaving cotton and woolen goods, carpets, etc. . . .

TEMPERED STEEL WIRE STRIPPER CARDS

L. S. Watson Mfg. Co.,

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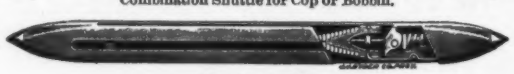
Especially Adapted to Short Shuttles for Long Bobbins.

DUDLEY'S PATENT "DANDY" SHUTTLE SPINDLE AND CATCH

Combination Shuttle for Cop or Bobbin.



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STEWART & SONS

MANUFACTURERS

LOOM REEDS

Jasper and Orleans Sts., Philadelphia, Pa.

LESLIE'S TEMPERED STEEL REEDS

Are the best for all weaving work and 100 per cent. more durable than any others.

LOOM REED AND HARNESS COMPANY,

CHARLOTTE, N. C.

HOW CAN I GET MY TRADE-MARK ON MY GOODS?

By the Kaumagraph Process. It is the scientific, practical and economical method. *Absolutely uniform results on any fabric* guaranteed.

Samples on Request

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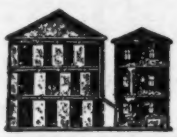

CHARLES H. SCHNITZLER

Patentee and Sole Manufacturer of

THE PNEUMATIC CONVEYOR

For the handling of wool and cotton stock, rags, excelsior, jute and all kinds of fibrous material, wet or dry. Also spool elevators, steam heating and ventilating and mill work generally. Blower and fan work a specialty. This conveyor is patented. Beware of infringement.

Satisfaction Guaranteed

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SOLE MANUFACTURER OF

Dixon Patent Locking and Stirrup Adjusting Saddles and Stirrups.

The weight can be taken off and put on to the middle rolls, without stopping your frames, when long stapled cotton is used. The stirrup is always in place. No bent stirrup resting on rolls. Manufacturers of all kinds of saddles, stirrups and levers. Send for samples and prices. **Spinners' Supplies in General.**

THE DENN WARPING MACHINERY,

LINKING BALLING SLASHER **WARPERS** 100 to 3,200 ENDS

Electrical Stop Motion applied to all Creels.

Globe Machine & Foundry Company, Inc.

Successor to GLOBE MACHINE WORKS.

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EVAN ARTHUR LEIGH,

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SOLE AGENT in the United States and Canada for

Platt's Cotton, Woollen and Worsted Machinery

Improved Machinery for Preparing, Drawing and Spinning Worsted Yarns on the French System.

Patent Barchant Machinery for making yarns from Cotton Waste, etc.

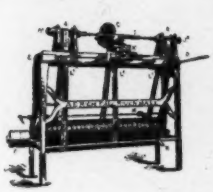
Lowell Burr Cylinder Works.

Garnett Wire of all Kinds. Licker in Cylinders rewound. Fluted Steel Rolls re-necked, re-finished, and re-ground for Cotton Spinning Twisting and Fly Frames.

Good Workmanship and Prompt Delivery Will Be GIVEN ALL ORDERS.

G. A. McINTOSH,

148 Warren St. - Lowell Mass.



Top Roll Grinding

—AND—

Buffing Machine

Manufacturers and Repairers of

FLUTED STEEL ROLLS

For

COTTON, WOOLEN, SILK.

ESTABLISHED 1893.

A. E. RICH & SONS,

189 Second St., - Fall River, Mass.

THE COHOES IRON FOUNDRY & MACHINE CO.

Cohoes, New York

SLASHING MACHINERY

OF EVERY DESCRIPTION

Wide Headways, Double Headways, Positive Geared Drives for Cylinders, Size Pumps, Size Kettles, Slasher Wraiths, Regulator Valves, Compression Rolls for Loom Beams, Overhead Tracks, Pulley Blocks. Repairs for P. C. & M. Mules, John Mason Frames and Empire Looms. First Class Mill Elevators—Belted, Electric, Garage, Hand-Power, Tape Dressing Machines, Yarn Beam Trucks, Drawing-in Frames, Spindle and Bobbin Gears, Cut Gears, Knit Goods Presses, Cotton Bat Presses, Elevator Cables.

OUR quality and OUR prices will interest YOU.

"VICTOR" RING TRAVELERS

are accurate in weight,
even in temper
the highest grade

Victor Shaw Ring Traveler Co.

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Send for discount sheet. It'll pay you

U NEED THEM WE MAKE THEM **ABC** STENCILS & SEALS

ATLANTA RUBBER STAMP & STENCIL WKS. 31 S. BROAD ST., ATLANTA BELL PHONE & ATLANTA PHONE 519

Bradley Stencil Machine

The Typewriter of the Shipping Room
Makes Shipping Stencils in half a minute at cost of 1-10 Cent Each

Universally acknowledged to be the most improved and economical device for shipping room on the market. Endorsed by all transportation companies. Adopted by the United States and British Government.

A. J. BRADLEY, General Sales Agent

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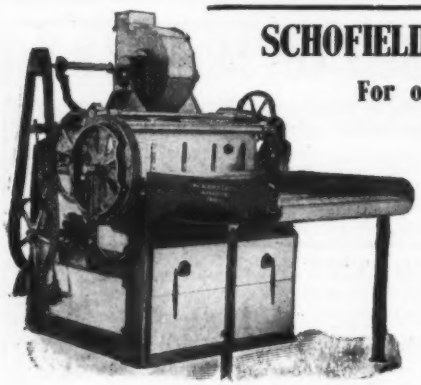

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For opening and dusting Wool, Cotton, Linters, Hair and kindred fibrous substances.

"Schofield" intermediate feeds, Wool, Rag, Waste, Hair and Lumper Pickers, Automatic, Cone and Oldham Willows, Rag and Extract Dusters, Waste Pullers, Blamaine Lap feeds etc.

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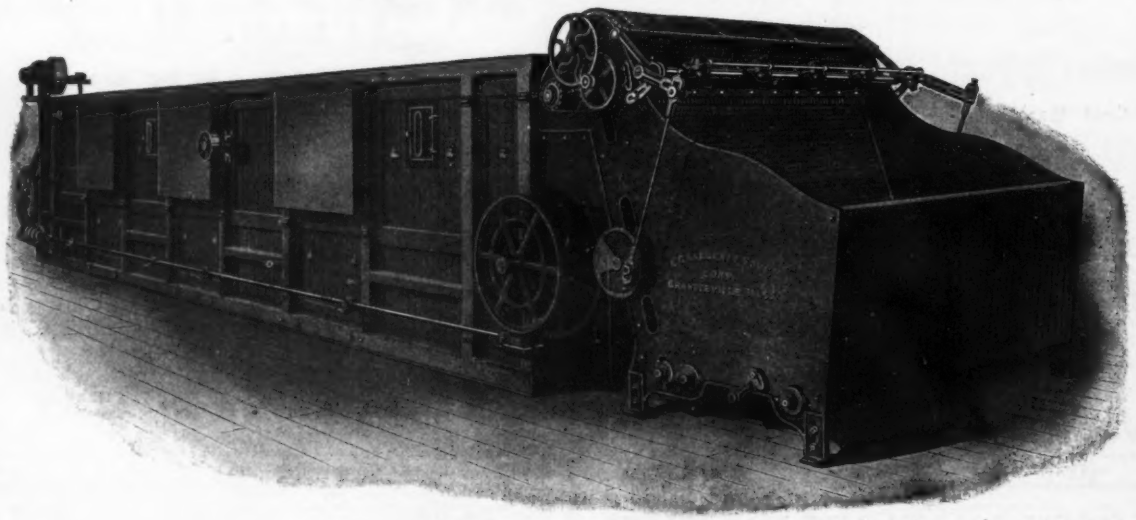

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BUILDERS OF

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¶ A Fan or Fan System may do the work and still be unsatisfactory.

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¶ Sturtevant Engineers have this knowledge, gained by years of special training in fan work. They are backed up by the most experienced and largest organization of fan experts in the world.

¶ When you need a Fan get the right one. Our experience is at your service.

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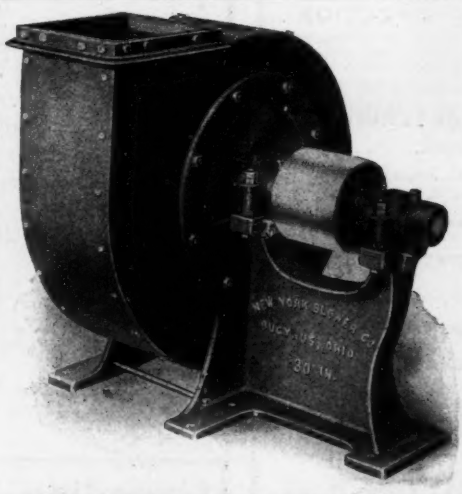
When a man tries our Cotton Fan once, he is pretty sure to want another of the same kind for his next job. There are no two ways about it. The repeat orders come in pretty thick and fast. That's why we sell them by the car load.



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The only Textile Mill Paper published in Canada.
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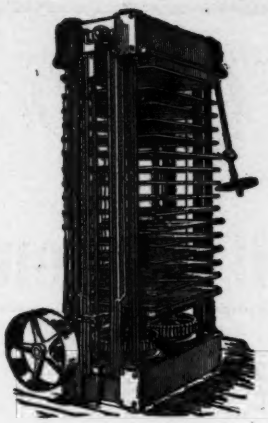

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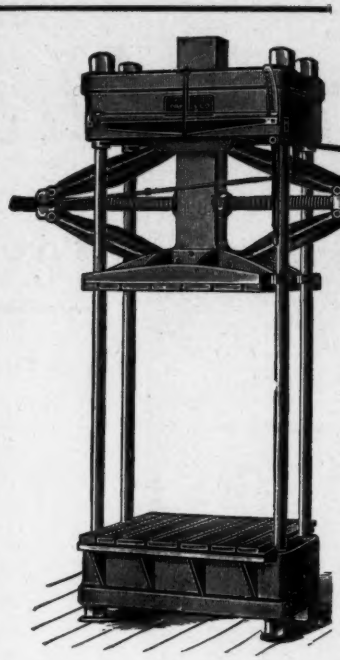

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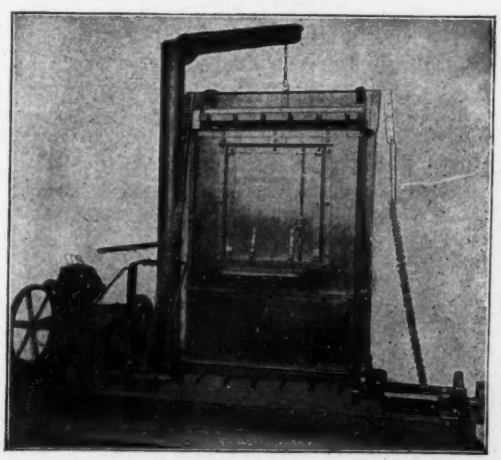

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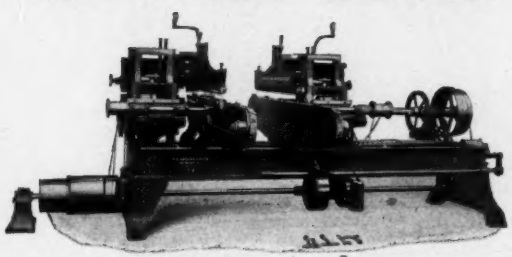

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Double-end Tenoners for Car Shops, Door, Sash and Blind Factories, Furniture and Cabinet Shops, Crate Makers, etc., etc.

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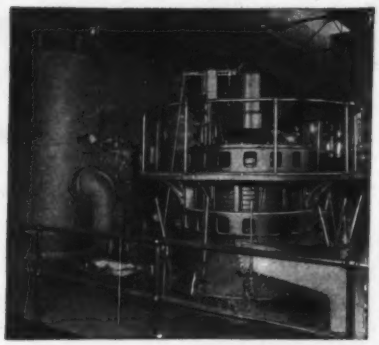

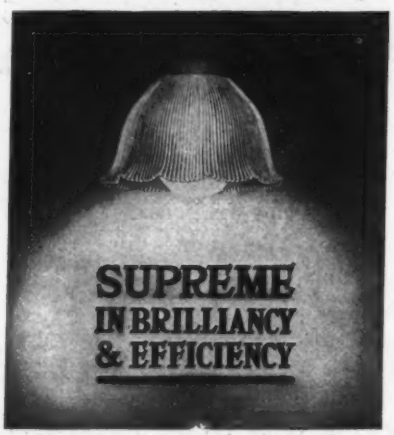

Textile Mill Economies

Exhaust Steam Turbines

in the power-house afford a highly efficient means of utilizing the exhaust steam from reciprocating engines. Curtis Low Pressure Turbines utilize exhaust steam from 1 pound gauge pressure to any obtainable vacuum, and will add from 30 to 100 per cent. to the station output without using additional fuel. These turbines are available in standard sizes from 300 kilowatts up and possess the same characteristics of operation that have made the Curtis Steam Turbines the peerless prime mover.

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in the mill result in reduced operating and maintenance costs, besides increasing the output and quality of the product. Reduced building expenses and increased working space also follow as direct results of the adoption of electric drive. This is due to the elimination of heavy and bulky line shafting and the consequent lighter construction materials required. Of the total power supplied through electric motors to textile mills in this country, 75 per cent. is delivered by G. E. motors. There's a reason.

Tungsten Lamps

in every part of the mill will give you the same amount of illumination as ordinary incandescent lamps, but will use only one-third as much current. If you want to get more light without increasing your light bill, or if you want to relieve your overloaded lighting plant, G. E. Tungstens will help you. Furthermore, the quality of the light given by G. E. Tungstens is almost equal to daylight, the ideal light for textile mills. These are good points to remember when you are considering the lighting question.

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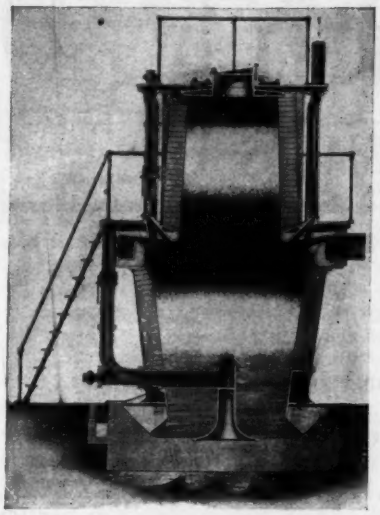
Westinghouse



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For Bituminous Fuels

Westinghouse Bituminous Producers in combination with Westinghouse Gas Engines, represent the utmost possibilities in fuel economy; the most convenient and efficient plan for utilizing lignites.

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Note the Contrast

as shown in the illustration, of the working conditions surrounding the belt-driven spinning frames in the background and those in the foreground, individually driven by Westinghouse Motors.

There is no slip nor loss of power with Westinghouse Individual Motor-Drive; every frame becomes an independent unit, driven at exactly its maximum producing capacity, and consuming only just the power required to operate it.

Ask your nearest office for a set of "Textile Motor Talks"

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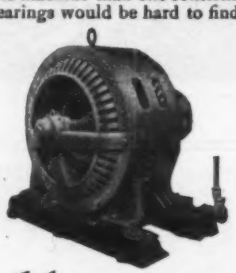
The Simplest Machines

always last the longest and work the best

A more simple machine than one consisting of a single shaft rotating in two bearings would be hard to find.



Hawthorn
TRADE MARK.
Motors

are built just that simple—one rotating part and two bearing surfaces

"Hawthorn" Motors are carefully built of good material and will stand the severest service. They will drive your machines safely, surely and economically.

All types for all commercial circuits.

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The strongest Guards for the longest service.

No obstruction of light.

Just protection all the time—anywhere.

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They will save lots of trouble and reduce your lamp cost.

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APPLIED TO OVER 20,000 LOOMS.
AGGREGATE—SUM OF REPEAT ORDERS.
REPEAT ORDERS, BEST COMMENDATION OF MERIT.
FURTHER EXTENSIONS OF EQUIPMENT NOW IN PROGRESS.

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No continuously moving mechanism:—Therefore, No lubrication and attendant care.

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The entire hose or stocking made and put together on one machine

That is what our automatic hosiery machine does; makes the foot and the rib-top on half-hose—or tucked-top on ladies' stockings—all together; and turns out this hosiery in strings by the yard or the mile.

6½ dozen pairs of half-hose per day are made on a 186-needle machine. The machine is built in guages, from the coarsest up to and including 220 needles—3¾. One operator can attend to 15 or 16 machines And one adjuster or fixer can look after 100.

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No skilled topper is needed. You save that labor-cost. And the work goes on as you want it, independent of the skilled operator.

If you are interested, we would like to give you a few figures showing the profit and advantage of these machines.

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For Knitting the Latest Style Fabrics.

FOR

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The Stafford and Holt Pineapple Stitch Machine is the Latest

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HIGH GRADE

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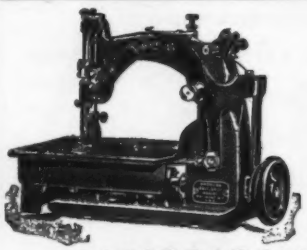

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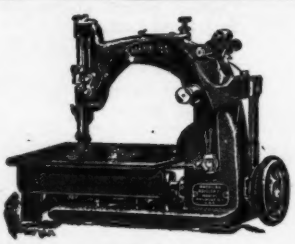
Dewers Toggle Trimmers or Shear Trimmers Twin Needle Machines for Fancy Stitching. Two Needle Machines for two-row stitching in one operation. Single needle machines for finishing. Speed as fast as any other make.

Full line of needles and parts for the above machines and also for the Union Special Toggle Machines at reasonable prices.

Ravelling attachments for any round, circular looping machines for ravelling the toes of hosiery or knit underwear full fashioned.



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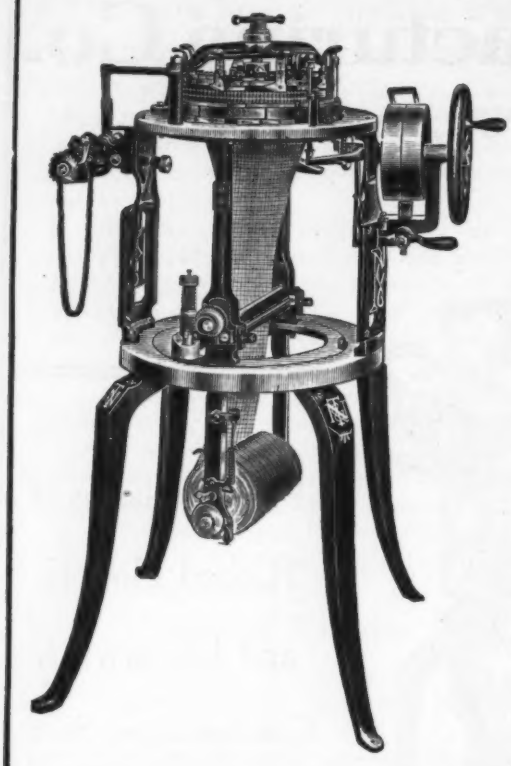

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will find that the Most Economical, the Most Reliable, and the Most Highly Developed Fully-Automatic

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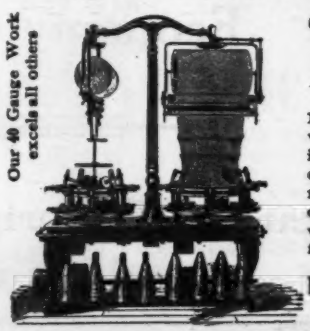

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40 Years Experience

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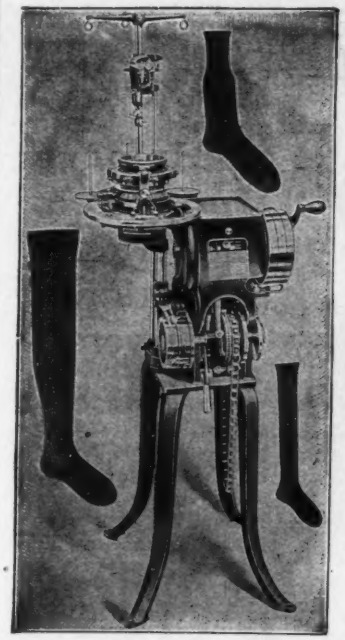

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CHAS. COOPER'S
Machine & Needle Works

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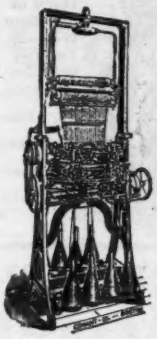
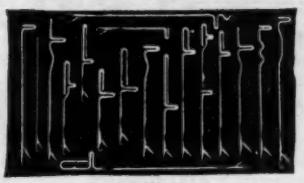


Spring Needle Cylinder Rib Top Machine



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For Plain and Ribbed Underwear, Shirt Cuffs Drawer Bottoms, Stocking Tops, Etc.

Spring and Latch Needles of All Kinds. Automatic RIB CUTTING and FOLDING MACHINE for Cutting and Folding Fleece Rib Cuffs.

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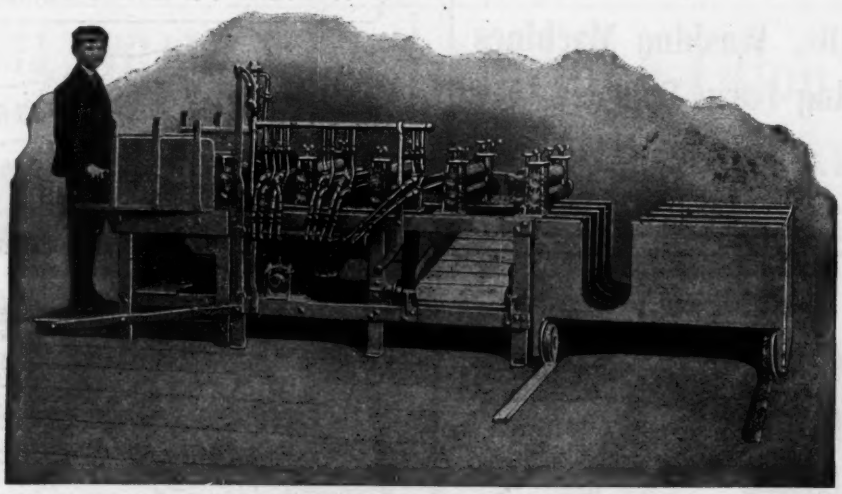

Automatic Singeing Machine and The Cold Hosiery Press.

The Automatic Singeing Machine is the only machine on the market equipped with a Patent Single Plate Positive Stripping Device, which saves gas, hose and labor. Built in two sizes, double and single feed.

The Cold Hosiery Press is very simple to operate, is less expensive, no complicated parts and requires very little power. With this press the life of the yarn is retained and the finish of the hosiery after coming out of the press can not be equalled by any other press, hot or cold. The press is built in two sizes. For further information address as above.

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"CORONATION"

PIECE END

SEWING

MACHINES

On English stand sent on trial most anywhere.

SEND FOR CIRCULAR.

BLEACHING, DYEING & FINISHING MACHINERY

BIRCH TREE.

Sews any Fabric Thick or Thin Wet or Dry Without Change Fine Stitch or Coarse Stitch

30 TO 60% INCREASE

On all makes of circular Rib Machines

STOP MOTION FOR DOUBLE KNEE WORK
INTERCHANGEABLE HOSIERY STAMP/
TRANSFER CUPS.
FLAT KNITTING MACHINES equipped with

CLIMAX

- Power Motion
- Automatic Racking
- Chain Saving Device
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- Separator
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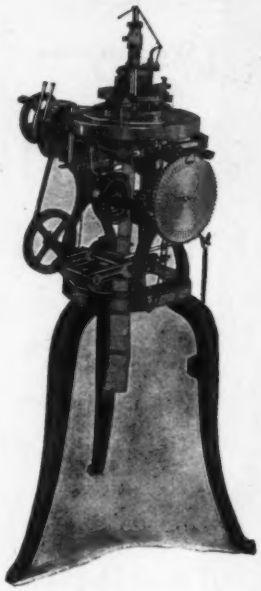

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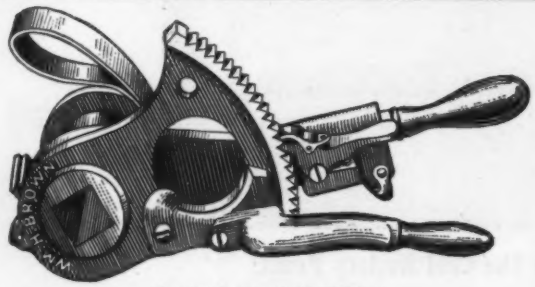

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Representing leading mills operating well equipped bleachery, dyehouse, spool, cone and twist mill

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Will buy odd lots of all kinds. Send sample and cash price. Sale Knowles looms, 80 in., 72 in. and 60 in., all 4x4 box; 14 webbing looms, with all accessories for a plant of that description. Also 1 Gas Engine, 4 Horse-power, a No. 1. condition. (Vulcan make.)

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Linen Yarns for Hosiery and Weaving. Turkey Red Yarn for Towel Manufacturers. Linen Jacquard Harness Twines. Fine Cotton Harness and Heddle Twines.
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from 1⅛ to 1½-inch staple.

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Special attention to mill business. Cotton handled at all mill points under satisfactory guarantee. Spinners' orders filled promptly through our own agents from desirable points south and west.

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Future Orders Executed to Hedge Spot Purchases or Sales of Goods.

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Established 1860--Incorporated 1893

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Waste Purchased on Yearly Contract from Mills

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Shipments Direct to Mill From Egypt, Peru, and all American Southern Ports

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TEXTILE MANUFACTURERS

Our extensive manufacturing facilities, east and west, enable us to economically produce artistic LABELS, FOLDING BOXES, BOOKLETS, CUT OUTS, POSTERS, WINDOW DISPLAYS AND ADVERTISING MATERIAL.

Would it not be well to send us samples of the material you are now using, mentioning quantity, and receive our proposal to supply your requirements?

New brands originated—old designs reproduced and modernized.

The United States Printing Company

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"LABELS THAT SELL GOODS"

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The American Moistening Company

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Received the Highest Award on recommendation of the Franklin Institute for

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Is the largest manufacturer of Humidifiers in the world The last twenty years receiving the Highest Awards in this country and Europe for its Air-Moistening System. Eight Gold Medals and others.

The Only Perfect System of Air-Moistening

And Has Been Adopted by the Representative Manufacturers of this Country.

The only System adopted in the Textile Schools. Write for Booklet "T" on Humidification. Legal proceedings will at once be taken against infringers and users of infringements.

J. S. COTHRAN, Southern Representative, Trust Building, CHARLOTTE, N. C.

Second-Hand Water

may be used for driving water wheels, but would you think of using it for any personal use? Water that has been used over and over again for humidifying purposes is as unfit for the human system as in any impure form.

The Turbo-Humidifier

(The Humidifier with the Guarantee)

uses the water but once. Because of complete vaporization, it requires no drain pipes. There is no water to return. The only excuse for using second-hand water in humidifying is on account of the expense, since those humidifiers which do so, vaporize but from 3 to 5 per cent. of the water used. They throw away 95 to 97 per cent. It is possible to deliver pure water into a mill for humidifying at less annual expense than the cost required to deliver impure water.

THE G. M. PARKS CO., *Sole Agent*
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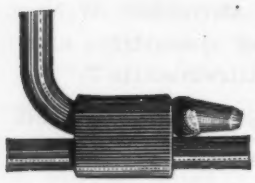
Southern Office: No 1 Trust Building, Charlotte, N. C.
B. S. COTTRELL, Manager



Locking Device for Clip.

"A Triumph of Experience Over Hope,"

as the great English Statesman, Disraeli, said in learning of a friend marrying for the second time.

Morris Duck Baskets

Have long passed out of the hopeful stage. They have been tried and tested by some of the largest textile mills in the country and the army of Morris Basket Believers is increasing every day.

The locking device we are now employing in the manufacture of Our Baskets bring them to a very high state of perfection.

In a nutshell, Morris Baskets are best because they are built to be best. They are rigid and yet have enough give to withstand sudden impacts; they are made of heavy closely woven cotton duck, the same as the U. S. Government specifies, the highest test known.

An added feature which means a big saving to you is that when the runners begin to show where you attached a small steel shoe in a few minutes time and your baskets are never out of service for repairs until they are thoroughly worn out.

Write us for catalogue now and make a trial. Others have been much surprised. We feel sure you will be too.

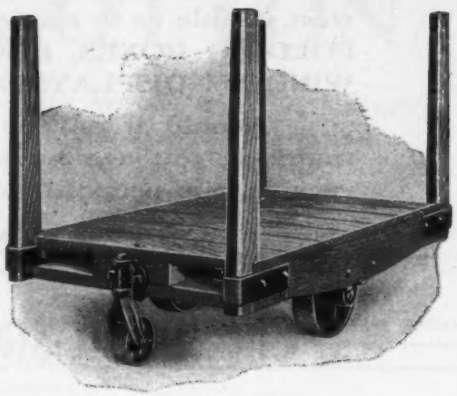
MORRIS & CO.

Department C

GROVEVILLE NEW JERSEY

PAT'D MORRIS TRADE MARK YARDVILLE N.J. BASKET REG.

ROLLER BEARING TRUCKS AND CARS



We Manufacture Trucks and Cars Of All Kinds, For All Purposes

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Chase Foundry & Mfg. Co.

COLUMBUS, OHIO.

PORTABLE ELEVATORS

Will pile more stock, in smaller space, in less time and with

ONE-HALF LABOR COST

of any hand method known. Hand or Electric Power for Mill, Compress, Warehouse and Dock use.

WRITE FOR INFORMATION

Economy Engineering Co.,

218-224 N. Jefferson St.,

Chicago, - - - - - - - - - Ill.

Lane Canvas Mill Trucks,

BOXES AND BASKETS

Have established a reputation for Strength, Durability and Economy.

FIG. 27

Mounted on stationary iron frame wheels, as shown, or on swivel anti-friction casters.

MADE IN ALL SIZES, TO SUIT ALL REQUIREMENTS.

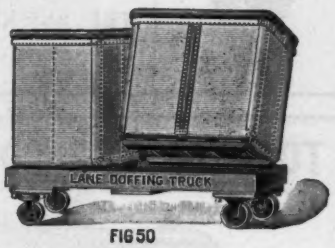

FIG 50

Mounted as shown above, or tilting, like Fig. 27, if preferred.

PRICES QUOTED ON APPLICATION.

W. T. LANE & BROTHER, Manufacturers,

POUGHKEEPSIE, N. Y.

N. L. WILLET SEED CO.,

AUGUSTA, GEORGIA

Cotton Planting Seeds.

COTTONS.—We list fifty kinds.

Short Staples—Early small bolls, and late.
Short Staples—Big bolls.
Long Staples—Upland and Sea Island.

NOTE.—Get our 1909 Seed Catalog. Let us mail you one, The Cotton Department in it, 10 pages, is the largest issued in United States. We sell more Cotton Seed for American and foreign use than any house in the world.

FELTON'S New Style Wire Drawn LOOM DUSTERS

Practical, Durable, Economical

ASK YOUR JOBBER

S. A. FELTON & SON CO.

MANCHESTER, N. H.

THE "NEW CYCLONE 1905"
DUST COLLECTOR

FOR HANDLING

COTTON, BOLLS and LINT

Manufactured exclusively by
THE KNICKERBOCKER CO.
JACKSON, MICH.

TO KEEP THE COST DOWN

Use an accurate measuring machine that enables you to pay piece wo.kers by the yard or pick.
Registers automatically the output of all machines.
In daily use in many cotton mills and bleacheries.
Ask for catalogue No. 21.
C. J. ROOT COMPANY, Bristol, Conn.

THIS single copper case contains moistened surfaces from which the fan-driven air-current evaporates enough to raise the humidity to near the dew-point.
It cannot possibly carry away an excess of moisture; hence, no dampness or wet machinery, and ideal working conditions.

THE GRISCOM-SPENCER CO.
MANUFACTURERS
Bell System of Humidifying
Reilly Feed Water Heaters
Power Plant Apparatus
Of Every Description
90 West St., NEW YORK.

SIZING

THIS subject is one of the touchiest matters to approach a Textile Manufacturer on, at the same time it is one of the most important subjects in the mill, and should be followed more closely. Properly sized warps mean full production from the looms.
Don't stand still, but be progressive and break away from the compounds offered and sold in all shapes and forms.

GET AS CLOSE TO NATURE AS POSSIBLE, AND USE

GUM TRAGASOL

a raw material that will put you right.
DANKER & MARSTON,
BOSTON.

This Picker
Interests Careful Buyers

The cost of a leather tail picker depends upon the cost of the leather of which it is made. We cannot furnish a first class belt leather picker at the same price as one made of inferior leather, but we have a belt leather picker which we can furnish in standard sizes at a very low price considering its quality. Sample and price on application.

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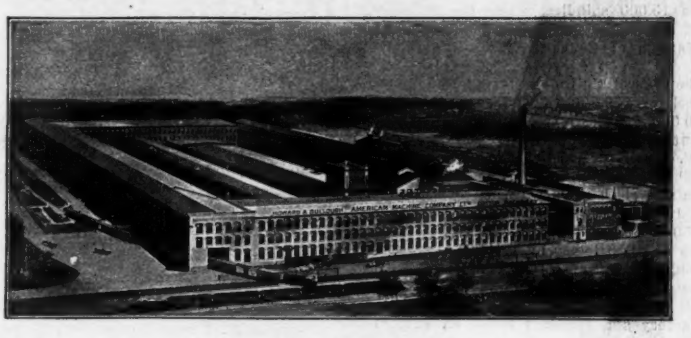
COTTON MACHINERY



ARE YOU INTERESTED TO KNOW WHAT IS THE BEST?

SEND FOR OUR DESCRIPTIVE CIRCULARS WITH LISTS OF USERS.

HOPPER BALE OPENERS
FEEDERS
SELF FEEDING OPENERS
BREAKER INTERMEDIATE
and FINISHER LAPPERS

REVOLVING FLAT CARDS
DRAWING FRAMES
SLUBBING FRAMES
INTERMEDIATE and
ROVING FRAMES

IMPROVED SPINNING FRAMES
TWISTERS
CONE WINDERS
WARPERS and SLASHERS

WE INVITE YOUR INVESTIGATION AND COMPARISON.

the Oakland Cotton Mills of this place. Both mills manufacture cordage, twine, etc. The purchased mill has an equipment of 14,000 spindles and 50 looms, the combined capital of the two mills being $2,500,000.

Georgia.

ALBANY. The Albany Cotton Mills have awarded contracts as follows: Erection of buildings to John H. Lowe, of Columbus, Ga.; furnishing mill work to Dudley Sash Door & Lumber Co., Columbus, Ga.; and constructing reservoir to R. J. Edgerty of Albany, Ga. The building will be three story, 135 x 185 feet. The cotton warehouse will be 100 x 150 feet., and there will be 60 operatives cottages. The equipment of the mill will consist of 10,800 spindles and 280 looms for manufacturing broad sheeting and print cloths. Lockwood, Greene & Co., Boston, are the architects in charge.

COLUMBUS. The Bibb Mfg. Co. has given an order to the Whitin Machine Works, Whitinsville, Mass. for 16 combers, 3 ribbon lap machines, and 3 sliver lap machines This additional equipment will cost about $25,000.

COLUMBUS. The Georgia Mfg. Co., has awarded the contract for 4,160 spindles to Lowell Machine Shop, Lowell, Mass. Will be in a position by January. This additional equipment will increase the mill's spindleage to 8,320 spindles. The additional equipment will cost about $60,000.

DOUGLASVILLE. The Lois Cotton Mills will increase their equipment from 10,000 to 20,000 spindles. The capital stock will be increased from $150,000 to $450,000. 40 new operatives houses are being erected.

PHELPS. Buell Stark of this city contemplates building a cotton mill.

PORTERDALE. The Bibb Mfg. Co. will add 5,000 spindles with the necessary preparatory and finishing machinery.

RAYMOND. R. F. Shedden of Atlanta, Ga., is interested in the proposed organization of a company for the purpose of establishing a mill in this town. Two railroads pass through the place which is admirably suited for a mill. Correspondence is invited.

WEST POINT. Hoffman-Corr Mfg. Co., of Philadelphia, Pa., has been consolidated with the Lang Mfg. Co. and will move its entire plant to this city. The new plant will spin its own yarn, having its own dye house and Jacquard weaving plant. Additional buildings will be erected, and the dyeing and weaving departments enlarged.

Kentucky.

LOUISVILLE. Bradford Worsted Spinning Co. will erect a three-story addition 80x240 feet, and will increase the spinning equipment from 2,200 to 7,000 spindles, with 3,500 twisting spindles. A 700 H. P. Corliss engine, four 200 H. P. boilers, a direct driven generator, and motors will also be added. The contract for all the machinery was awarded to Edward Jefferson & Bro., Philadelphia, Pa. The building will be completed by December 1.

Maryland.

ILCHESTER. The Thistle Mills have been incorporated with a capital stock of $150,000. Company has been reorganized with Albert Blakely, Pres.; R. C. Stewart, Vice-Pres. and Treas. The company takes over an established plant with 10,000 spindles and 250 looms. 500 H. P. is required for the production of print cloths, sheeting and duck.

Massachusetts.

ADAMS. Berkshire Hosiery Co. has filed articles of incorporation, and will manufacture woven and printed fabrics. The capital stock is $15,000.

FALL RIVER. Lincoln Mfg. Co. Reports state that this mill will add $100,000 capital to its stock and increase its equipment by 10,000 spindles.

NEW BEDFORD. The New Bedford & Agawam Finishing Co., is the name of a new cloth finishing mill to be erected at East Wareham by John W. Knowles of the Page Mill and Eugene S. Graves, recently of the New Bedford Textile School. The company will be capitalized at between $200,000 and $250,000, and the plant will probably be in operation by early spring.

Mississippi.

LAUREL. It is reported that another cotton mill is contemplated for this city.

Missouri.

ST. LOUIS. St. Louis Knitting Co. has been incorporated with a capital stock of $200,000 by Chas. A. Shreiber and others.

New Hampshire.

MANCHESTER. The Amoskeag Mfg. Co. will erect an electric power plant to run the new Coolidge Mill.

New Jersey.

LAKEVIEW. Doherty Mill. The contract for the erection of this mill is reported as having been awarded to T. S. Van Kirk Co., of Paterson, N. J. The cost will be $139,000.

(Continued on page 112.)

New York.

AMSTERDAM. Shaughnessy Knitting Mills Co. has been incorporated with a capital stock of $40,000, the directors of the company being Martin Shaughnessy, Howard B. Spencer, and Jos. H. Dwyer.

ELMIRA. The Elmira Knitting Co. is planning the erection of a two-story, 200x70 feet, store house, built of concrete and stone. The new addition will be used for the storage of raw cotton.

North Carolina.

ALBEMARLE. The Efird Mfg. Co., and the Wiscassett Mills Co., have voted to begin the erection of additional buildings to their plants. The Efird addition will consist of a two-story, 300x50 feet building to contain 15,000 spindles, while the Wiscassett enlargement will consist of a 100x300 feet building equipped with 25,000 spindles. J. W. Cannon of Concord, N. C., president of both mills.

BESSEMER CITY. The Mascot Cotton Mills Co. has been organized with a capital stock of $50,000 to succeed the Bessemer City Cotton Mills, having 9,000 spindles and 450 looms. This company plans the development of water-power and it will also improve its dye house. C. W. Fuller, president.

CHARLOTTE. Mecklenburg Mfg. Co. has awarded a contract for the erection of an office and cloth room. The company will install additional equipment in the present building, which will include 2,000 spindles and 50 looms. The total equipment will be increased to 15,000 spindles and 350 looms on print cloths.

CHARLOTTE. It is understood that cotton manufacturers are negotiating for the purchase of water-power property owned by Toney & Kirkpatrick of Erwin, Tenn., on the Nolichuckey River. They propose to erect a factory and transmit 3,000 H. P. to the mill.

DURHAM. J. K. Mason of the Fidelity Bank and associates are contemplating the organization of a company to manufacture cotton rope, twine, and cordage. It is reported that the capital stock will be from $25,000 to $30,000. Bids are invited from machinery manufacturers.

ENFIELD. The Enfield Hosiery Co. plans the establishment of a branch knitting mill to be capitalized at $100,000.

GOLDSBORO. The Durham Hosiery Mill, No. 5, has been incorporated by J. S. Carr, Jr., Austin H. Carr, of Durham, and H. B. Flowers and Mrs. W. F. Pattern, of Kansas City, Mo. The capital stock is to be $50,000.

HICKORY. M. E. Thornton plans the organization of a company capitalized at $4,000,000 to erect a mill for making fine grade fabrics and to be run by electric power.

HICKORY. J. A. Martin and associates of Newton, N. C. are interested in the organization of a company to build a cotton mill.

HICKORY. The A. A. Shuford Mill Co. has been incorporated, it is reported, with a capital of $80,000, manufacturing principally No. 8s cotton yarn. The incorporators are A. A. Shuford, G. H. Geitner and others. Electricity will be used for power, and 200 H. P. has been contracted for.

HIGH POINT. The Piedmont Mills Co. has been organized with a capital stock of $40,000, to build a knitting mill. The structure will be a three-story, 60x150 feet, brick mill. J. H. Adams, manager.

LENOIR. The Moore Cotton Mils Co. will add 2,176 spindles to its present equipment of 3,200 spindles. The capital stock of this company has lately been increased from $80,000 to $125,000.

PENROSE. The Penrose Mfg. Co. is installing 100 knitting machines for manufacturing hosiery. Will buy yarns at present. M. L. Talley is president. The company is capitalized at $150,000.

RALEIGH. The Acme Knitting Mills will be organized by J. E. Matthews.

SAXAPAHAW. J. W. Menefee and associates plan the organization of a company to build a cotton mill and a hydro-electric plant.

SMITHFIELD. The Ivanhoe Mfg. Co. Work has been started on the construction of the buildings for this mill which will be 103x304 ft. and an engine and boiler house which will be 47x90 ft., also a cotton storage house and 20 operatives' cottages. The equipment will consist of 5,120 spindles for the production of 20s and 30s hosiery yarns. The building will probably be completed early in 1910. It is capitalized at $300,000; W. M. Sanders, president; F. K. Broadhurst, treasurer.

SPRING HOPE. G. W. Joyner of this city is reported as planning the organization of a company to build a cotton mill.

STATESVILLE. The Statesville Cotton Mill has awarded a contract to the Draper Co., Hopedale, Mass., for 30 Northrop looms which are now being installed.

THOMASVILLE. The Jewel Cotton Mill has been incorporated with a capital stock of $250,000 for the erection of a 5,000 spindle mill for manufacturing cotton yarns. The building will be 87x380 feet. The contract has been awarded to T. C. Thompson & Bro., Birmingham, Ala. The mill will be operated by electricity from the Thomasville transmission station of the Southern Power Co., of Charlotte, N. C. J. L. Armfield, Pres.

THOMASVILLE. J. G. Gilbert, A. H. Ragan, and F. S. Lambert and others plan the organization of a company for the erection of a cotton mill.

VASS. The Vass Cotton Mills Co. has been incorporated by A. Cameron, J. A. Keith and others with a capital stock of $250,000. The mill will be equipped with 5,000 spindles for making yarns.

WHITEVILLE. J. H. Crowell plans the establishment of a knitting mill at this place. Correspondence is invited from machinery builders.

WILMINGTON. Bellwille Cotton Mill of this place has been organized by J. D. Bellamy and J. Walter Williamson. The company has purchased the Wilmington Cotton Mills for $125,000 it is reported. It contains 7,000 ring spindles and 290 looms, etc.

WILMINGTON. The Runnymeade Mills have been incorporated with a capital stock of $62,500 by George Howard and associates.

WINSTON-SALEM. Maline Knitting Mills Co. has awarded the contract for the construction of a knit goods bleachery to J. F. Ange of this city. The building will be 60x170 feet with a daily capacity of 30,000 pounds of knit goods.

Oklahoma.

LAWTON. The Lawton Textile Mfg. Co. R. S. Curtis of Zion City, Ill., and associates are to organize this mill with a capital of $1,500,000, and Lawton Spinning Co. with a capital stock of $500,000, to manufacture laces and other fine cotton products. The organizers contemplate the construction of six main buildings with a total floor space of 470,000 sq. ft. 150 operatives dwellings will be built, and also several warehouses. It is estimated that about 12,000 bales of cotton will be consumed annually.

Pennsylvania.

EASTON. Chipman Knitting Mills have been incorporated with a capital stock of $400,000. The incorporators being Frank L. Chipman, W. Evan Chipman, W. V. Parker of New York City, and Chas. Chipman's Sons. W. Evan Chipman is treasurer.

PHILADELPHIA. Wm. H. Grundy & Co., operating the Bristol Woolen Mills, will build an addition to their plant to cost $150,000. The addition will be 200x90 feet and will enable the mills to increase the output about 60 per cent.

PUNXSUTAWNEY. The United Textile Co., of Allentown, Pa., have let the contract for the Punxsutawney Silk Mill to Jas. K. Long & Sons, of this city. The new mill is capitalized at $150,000, and will employ 100 hands at the outset and 400 later.

South Carolina.

ANDERSON. The Conneross Yarn Mill will increase its spinning capacity 50 per cent. It now operates 800 mule spindles, etc. Electric power.

ANDERSON. The Toxaway mills will add five spinning frames and accompanying preparatory machinery at a cost of about $6,000. New equipment will be furnished by the Saco & Pettee Machine Shops. This mill now operates 16,120 ring spindles and 484 looms on print cloths.

CALHOUN FALLS. Calhoun mills have awarded the contracts for the building and machinery for their proposed addition to be equipped with 10,000 spindles and 200 looms. The present equipment is 16,384 spindles and 400 looms, manufacturing wide print cloths. The additional building and equipment will cost about $200,000, which will be added to the present capital stock of $400,000. J. P. Gossett, Pres.

CENTRAL. The Issaqueena Mill has awarded contract for the 175 feet extension to its present building. This addition will contain 12,000 spindles and 300 wide looms for the production of wide print cloths. The building will cost $30,000, and the machinery upwards of $150,000. The capital stock has been increased from $200,000 to $300,000.

EASLEY. E. H. Shanklin is planning the organization of a company with a capital stock of $250,000, to erect a cotton mill. Equipment will be 10,000 spindles and 250 looms.

GREENVILLE. The Monaghan Mill is installing an additional electric drive to supplement the present 2,000 H. P. engine. Power will be furnished by the Southern Power Co., of Charlotte, N. C.

GREENWOOD. Grendel Mills. The stockholders of this mill have voted to increase the company's capital stock from $350,000 to $500,000. J. E. Sirrine of Greenville, S. C., is the architect in charge of improvements that are to be made.

NEWBERRY. The Newberry Cotton Mill has awarded contract for its equipment as follows: looms, cards, and drawing machinery to Whitin Machine Works, Whitinsville, Mass.; roving frames, Providence Machine Co., Providence, R. I.; slashers, Cohoes Iron Foundry & Machine Co., Cohoes, N. Y., pickers, Potter & Johnson, Pawtucket, R. I.; skewers, Easton & Burnham Co., Pawtucket, R. I.; warpers, T. C. Entwistle Co., Lowell, Mass.; brush and folder, Curtis & Marble Machine Co., Worcester, Mass. The mill will contain 10,000 spindles and 350 looms. The total cost of the enlargement will be about $250,000.

TROY. L. P. Mullinax plans the establishment of a knitting mill to be built next summer. The machinery has not been purchased.

WESTMINSTER. The Oconee Mills Co. is the new name of the former Cheswell Cotton Mills Co., which has increased its capital

(Continued on page 113.)

The Haskell-Dawes Machine Co.

....MANUFACTURERS OF THE BEST TYPES OF....

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SPECIALLY ADAPTED FOR MAKING ALL KINDS OF

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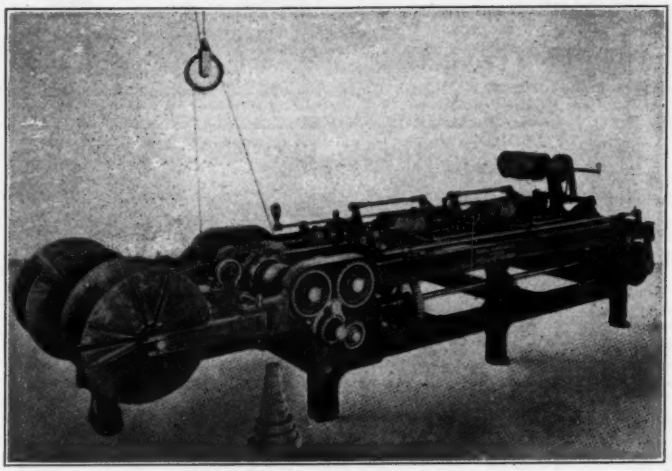

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TUBES
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Established 1832.

Moodus, Connecticut.

stock from $200,000 to $300,000. The present equipment is 10,272 ring spindles, 362 looms.

Tennessee.

JOHNSON CITY. B. D. Heath & Co., of Charlotte, N. C., it is reported, will erect a cotton mill at this place.

MEMPHIS. N. B. Graves of this city, it is reported, is to organize a company with an initial capital stock of $750,000, for the purpose of building a number of cotton mills in the South.

NASHVILLE. The Nashville Hosiery Mills are to be incorporated, to take over the mill operated recently by the Nashville Hosiery & Yarn Co., the equipment of which was 300 knitting machines with a daily output of 1200 dozen pairs of children's ribbed hosiery. A. H. McVail and associates are interested.

TRENTON. The Trenton Cotton Mill Co. is installing a 400 H. P. Hamilton and Corliss engine and is replacing a large amount of old machinery with modern equipment.

Texas.

HOUSTON. The Texas Fiber Mfg. Co. has been incorporated with a capital of $10,000. It will erect a 20x50 feet building and manufacture composition rubber and silk for women's garments. W. S. Turner, president, S. N. Davis, vice-president.

Virginia.

VIRGILINA. Virgilina Hosiery Mills have been organized with a capital stock of $10,000. P. H. Fontaine, Pres.; W. M. Pannebaker, Vice-Pres.; S. M. Torian, Treas.; and A. L. G. Stephenson, Sec.

Personal.

J. F. Allen has resigned as day overseer of spinning at the Harriet Cotton Mills, Henderson, N. C., to accept a similar position on the night force at the Caswell Cotton Mill, Kinston, N. C.

Sam Austin is superintendent of the Unity Mills, No. 2, at La-Grange, Ga.

H. M. Brannon is to be overseer of weaving and cloth rooms at the Beaver Dam Mills, formerly Edgefield Mills, Edgefield, S. C.

S. S. Campbell, formerly overseer of carding at Hope Mills, N. C., now holds a similar position in the Mary-Leila Mills, Greensboro, Ga.

J. L. Carr is overseer of carding and spinning at the Montala Mfg. Co., Montgomery, Ala.

J. B. Bailey has returned to his position as overseer of weaving with the Norris Cotton Mills, Cateechee, S. C.

J. W. Engle, from Bessemer City, N. C., has accepted a position as second hand in carding at Roanoke Rapids, N. C.

(Continued on page 114.)

B. C. Crawford has succeeded W. J. Lanham as second hand in weave room No. 2, of the Lynchburg (Va.) Cotton Mills.

F. E. Farrell has resigned as overseer of spinning at one of the Bessemer City Mills, to accept a similar position with the Lula Mill, King's Mountain, N. C.

Thos. E. Gardner has been promoted from overseer of carding in the White Oak Mills, at Greensboro, N. C., to succeed J. D. Campbell as superintendent.

L. B. Foster has resigned as superintendent of the Columbia (S. C.) Duck Mills, to accept a similar position with the new mills at Manchester, Ga.

I. W. Garrett, from Greers, S. C., has moved to Edgefield, S. C., where he has become head bookkeeper for the Beaver Dam Mills.

E. L. Goble is overseer of spinning, spooling, twisting, winding and warping in one of the Fayetteville, N. C., mills.

Z. V. Gray has resigned as overseer of spinning with the Manetta Mills, Lando, S. C., to accept a similar position with the Wylie Mills, Chester, S. C.

W. S. Griffin, from Hamer, S. C., is now second hand in spinning with the Holt-Williamson Mfg. Co., Fayetteville, N. C., succeeding Andrew Young, resigned.

J. T. Hancock has accepted a position as second hand in weaving at the Augusta Factory, Augusta, Ga.

C. R. Harman has resigned his position with the Locke Mills, Concord, N. C., and has accepted a position as overseer of carding at the Granby Mills, Columbia, S. C.

O. R. Harris has resigned as overseer of carding in Mill No. 1, Jacksonville, Ala., and will return to his home at Heath Springs, S. C.

Brooks Harwell, from the Delburg Mills, of Davidson, N. C., has accepted a position with the Mason Machine Works and is erecting machinery at Rockingham, N. C.

D. A. Holdclaw has resigned as machinist at the Woodlawn Mills, Mt. Holly, N. C., and is now in the employ of the Southern Spindle & Flyer Co., of Charlotte, N. C.

J. W. Holt has accepted a position as overseer of carding at the White Oak Cotton Mill, Greensboro, N. C.

Ed. Hoover, who has been farming near Gastonia, N. C., has become a loom fixer at the Loray Mill.

J. L. Hoover, from the Avon Mills, Gastonia, N. C., will become carder and spinner at Hamer, S. C.

T. B. Howard has become carder and spinner at the Brenham (Texas) Cotton Mills.

D. F. Howell, from the Delburg Mills, of Davidson, N. C., has accepted a position with the Saco & Pettee Machine Shops, and he is erecting machinery at Laurens, S. C.

J. J. Huffstickler has resigned as superintendent of the Ida Mill, Laurel, N. C., and taken a position as carder and spinner at the Octoraro Mills, Clio, S. C.

H. W. Hursey, formerly with the Wilson Cotton Mill, has accepted a position as overseer of spinning with the Whitley Mfg. Co., Wendell, N. C.

J. H. Jenkins has resigned as overseer of carding and spinning at the Camperdown Mills, Greenville, S. C., to accept a position with the Woodruff Mills.

J. L. Jones, formerly with the Pelham, Ga., Cotton Mills, is now with the Draper Co., at Clinton, S. C.

R. D. Jones has resigned as superintendent of the Brown Mill, Concord, N. C., to become superintendent of the Cowikee Mills, Eufaula, Ala.

R. H. Jones, from the Eno Cotton Mills, Hillsboro, N. C., is now card grinder with the Whitley Mfg. Co., Wendell, N. C.

J. W. Kaneer has given up the position of general superintendent of the Lumberton Mills, and will devote all of his time to the National Mills, Lumberton, N. C.

W. A. King has been promoted from overseer of weaving to superintendent of the Bibb Mfg. Co., Columbus, Ga.

N. C. Knight has resigned as overseer of spinning at Aragon, Ga., is now in Greenville, S. C.

John Lee has resigned as master mechanic at the Octoraro Mill, Clio, S. C.

M. M. Lehman has accepted a position as overseer of spinning at the Merrimack Mills, Huntsville, Ala.

G. H. Lokey, formerly of Calhoun Falls, S. C., has taken charge of carding at the Ide Cotton Mill, Jacksonville, Ala.

J. H. Lollis has accepted the position of machinist at the Williamston Mills, Williamston, S. C.

Edgar Love has been elected president, and James Love secretary of the Saxony Spinning Co., Lincolnton, N. C.

Mr. Lowe, from Mountain Island, N. C., has accepted a position as overseer of carding and spinning at the Delburg Mills, Davidson, N. C.

Z. R. Lytton has resigned as superintendent of the St. Pauls Mill, St. Pauls, N. C., and returned to Lumberton, N. C.

J. C. McConnell, from Anderson, S. C., is the new overseer of cloth room in the Jackson Mills, Iva, S. C.

A. I. McDonald has been promoted from carder to superintendent of the St. Pauls Mills, St. Pauls, N. C.

G. D. McIntosh, is the new overseer of weaving in the Cannon Mill, Kannapolis, N. C.

D. E. Madden has resigned as overseer of the cloth room at the Hermitage Cotton Mills, Camden, S. C.

E. G. Madison has resigned as overseer of spinning with the Glen Raven Mills, Burlington, N. C., to accept a position with the Lockmore Mills, Yorkville, S. C.

A. E. Massey has returned from Petersburg, Va., to Lavonia, Ga., to accept the position of overseer of carding.

T. B. Moose has resigned as carder at Kannapolis, N. C., and has accepted a similar position at the Locke Mill, Concord, N. C.

T. R. Morton, from the Fulton Bag and Cotton Mills, Atlanta, Ga., has accepted a position as overseer of spinning, spooling and warping at the Poulan (Ga.) Cotton Mills.

J. A. Mouney has resigned as overseer of cloth room at the Fairfield Cotton Mills, Winnsboro, S. C., to accept a similar position at Walhalla, S. C.

D. M. Myers has resigned as superintendent of the Hannah Pickett Mills at Rockingham, N. C., to become superintendent of the Brown Mill at Concord, N. C.

A. O. Norris, from Albemarle, N. C., has succeeded T. P. Moose as carder and spinner at the Patterson Mfg. Co., Kannapolis, N. C.

G. D. Oakes has been promoted from loom fixer to second hand of weaving at Proximity Mills, Greensboro, N. C.

H. Pennington, from Proximity succeeds Mr. Henley as overseer of weaving at the White Oak Mills, at Greensboro, N. C.

L. P. Pruitt has resigned as overseer of the cloth room at the Jackson Mills, Iva, S. C., to accept a similar position at New Holland, Ga.

G. R. Putnam, from Dallas, N. C., has accepted the position as second hand in carding at Dudley Shoals Mills, Granite Falls, N. C.

C. M. Rafter has resigned his position at the Olympia Mills, Columbia, S. C., to become overseer of carding at the Arcade Mills, Rock Hill, S. C.

A. A. Ramsey has become overseer of spinning in Mill No. 2 of Locke Mills, Concord, N. C.

H. K. Roberts from Cherryville, N. C., has become overseer of carding at the Salisbury Cotton Mill, Salisbury, N. C.

John R. Roberts has resigned as overseer of weaving in the Cannon Mill at Kannapolis, N. C., to accept the superintendency of the Hamburger Mills, Columbus, Ga.

T. M. Robertson has resigned as overseer of carding with the Seminole Mfg. Co., Clearwater, S. C.

Wade B. Roddy has accepted the position of secretary and treasurer of the Wymojo Mills, Rock Hill, S. C.

D. A. Rudisill has resigned as superintendent of the Cherryville, N. C., Mfg. Co., to accept a position as treasurer and manager of the same mill.

Edward Scott, from Warren, R. I., has resigned the position of master mechanic at the Drayton Mills, Spartanburg, S. C.

John C. Searcy has resigned as second hand in weaving at the Edna Cotton Mills, Reidsville, N. C., to accept a similar position with the Dan River Mills, Dan River, Va.

R. E. Sims has been promoted to overseer of weaving at Proximity Mill, Greensboro, N. C., to succeed H. Pennington, who goes to the White Oak Mills, Greensboro, N. C., succeeding L. A. Henly.

L. W. Sinclair has resigned as night spinner at Lakewood, N. C., to become second hand in spinning at the Springstein Mills, Chester, S. C.

E. E. Smith has resigned as overseer of spinning and twisting at the Wylie Mills, Chester, S. C., to accept a similar position with the Chadwick Mills, Charlotte, N. C.

J. M. Smith, formerly second hand in weaving at the Minneola Mills, Gibsonville, N. C., has accepted a similar position at the Edna Mills, Reidsville, N C.

W. P. Snelgrove, formerly cotton buyer for the Orr Cotton Mills, Anderson, S. C., is again identified with them in the same capacity.

J. B. Starnes, who has been fixing looms at the Highland Park Mills, Rock Hill, S. C., is now holding the same position with the Highland Park Mills, Charlotte, N. C.

A. G. Stewart formerly with the Monbo Mfg. Co., Monbo, N. C., has been engaged as overseer of spinning with the Linden Mfg. Co., Davidson, N. C.

H. H. Stewart has resigned as assistant treasurer with the Henderson Cotton Mills, Henderson, Ky., and has accepted a position at Montgomery, Ala.

C. P. Stutt, from Gibsonville, N. C., has been overseer of finishing at Ossipee Mills, Elon College, N. C.

R. W. Tennant, from Eureka, S. C., has become overseer of carding at the Tifton (Ga.) Cotton Mill.

W. Y. Thomas has resigned as overseer of spinning in No. 2 Mill of Locke Mills, Concord, N. C., to accept a similar position at Brevard, N. C.

J. D. Tice has been re-elected superintendent of the Conastee Mills, Greenville, S. C.

H. G. Tucker, from the Pee Dee Mills No. 1, Rockingham, N. C., has accepted a position as overseer of spinning and winding at the Harriet Cotton Mills, Henderson, N. C.

J. C. Walker will be master mechanic at Edgefield, S. C.

Geo. Williams has accepted a position in Newry, S. C., having resigned as second hand in spinning at Westminster, S. C.

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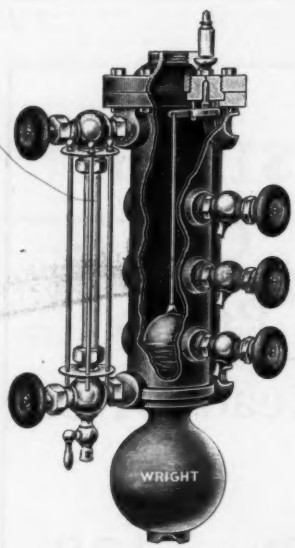

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1 42" " " " " Dienelt.
1 42" " " side " "
1 36" " " belt-drive Weston.
1 32" " " belt-drive Tolhurst.
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6 Portable Mill Sewing Machines.
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1 Set Warp, Drying Cans, 30 cans, 144".
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2 Elliot Cloth Folders.
3 P. & W. Cloth Lapping Machines.
2 Art Square Looms, 110", Knowles.
1 6-drum Allen Dresser Spooler, almost new.
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600 Dresser Spools, 32½"x9".
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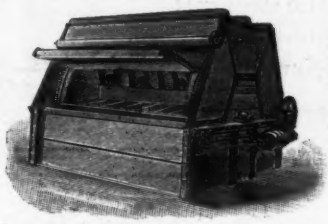

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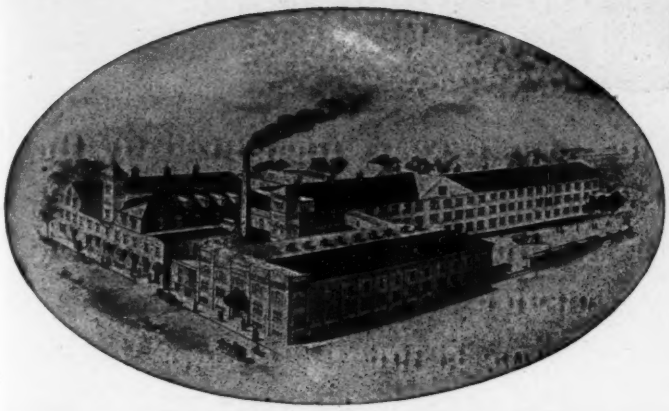

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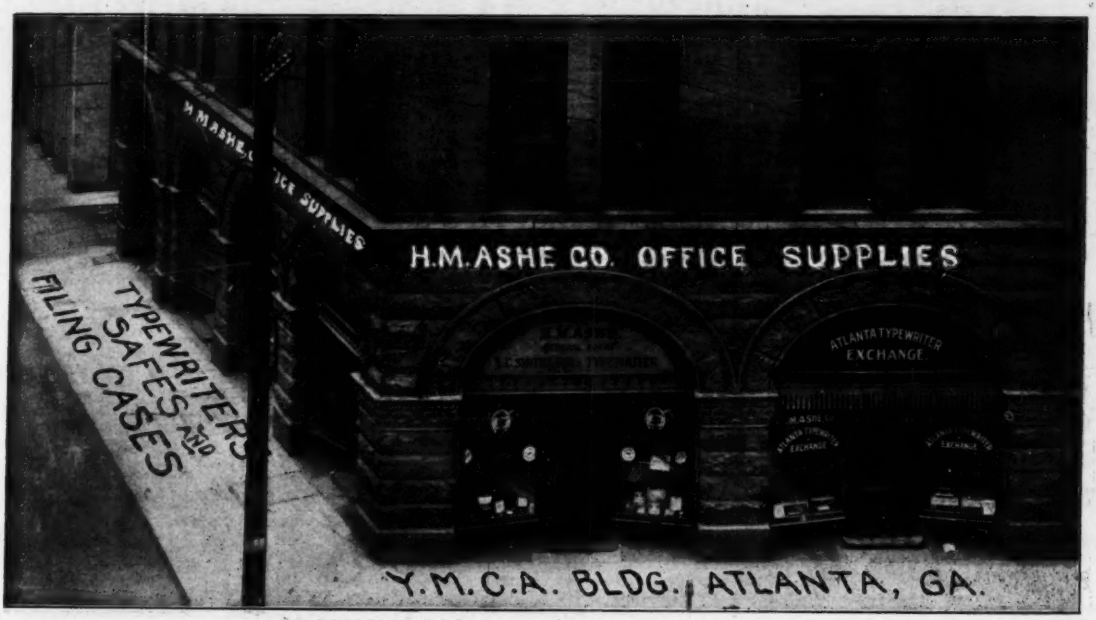

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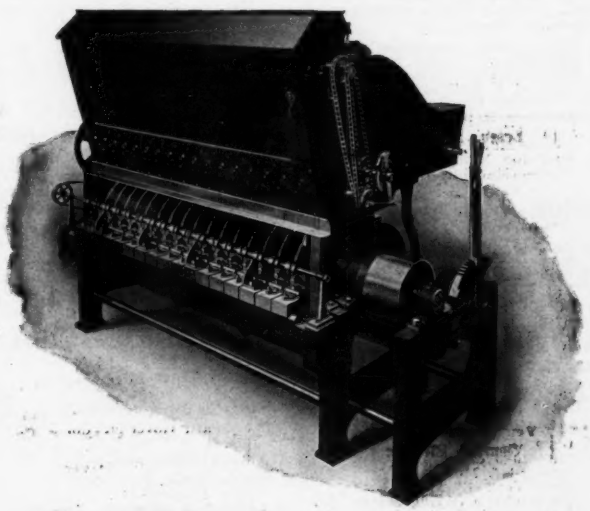

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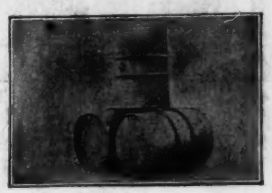

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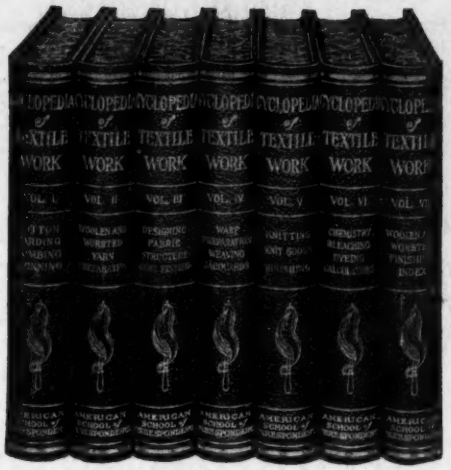

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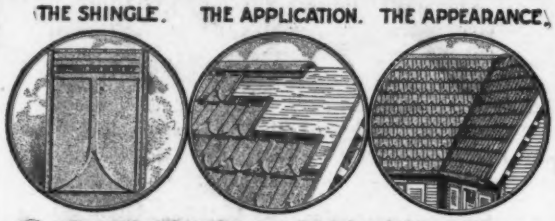

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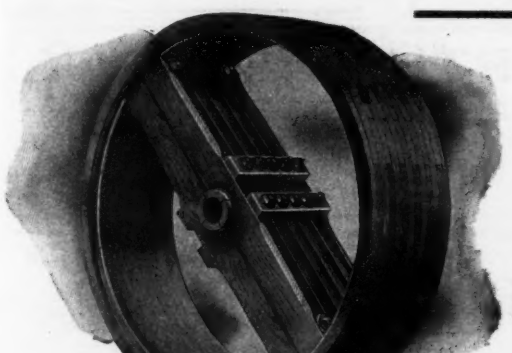

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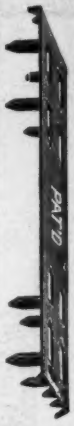

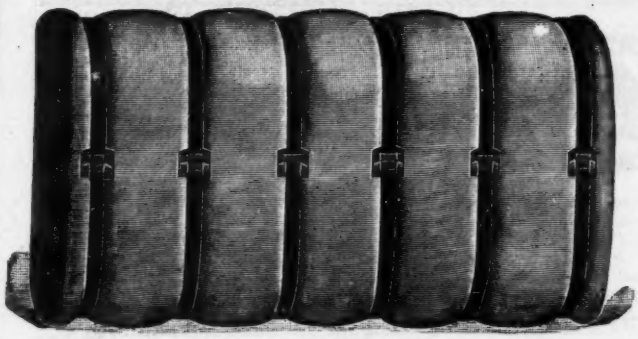

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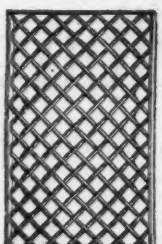

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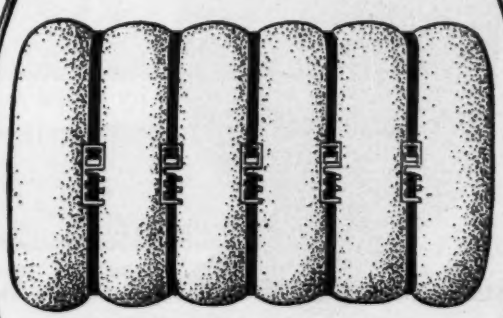

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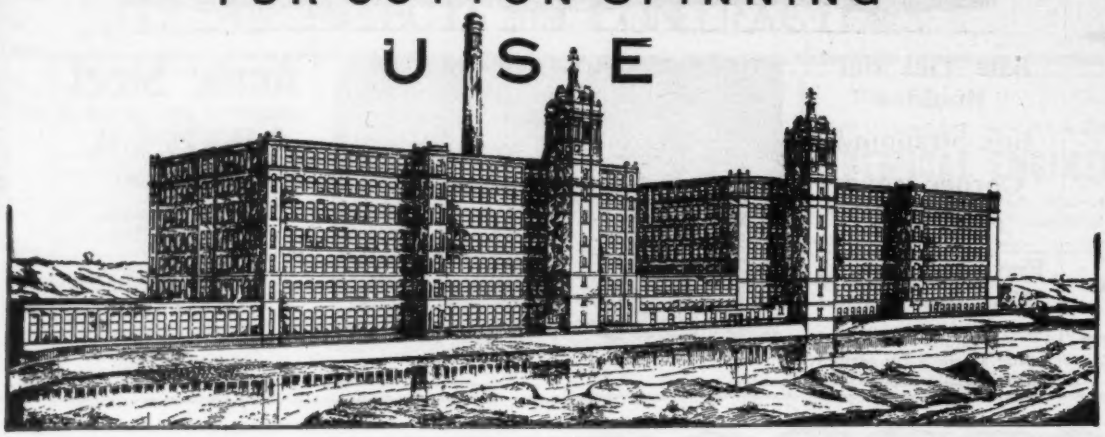

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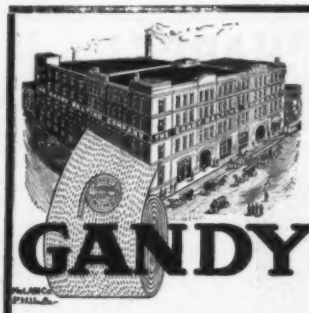

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RED Label Brand for Leather Belts only
GREEN Label for Rubber Belts
BROWN Label for Canvas and Rope Drives
BLACK Label for Link or Chain Drives and Gearing.

STEPHENSON MFG. COMPANY

ALBANY, N. Y.

Send 10c for Sample Can of STEMKO BELT KLEANER which removes oil and grease and rejuvenates Belting.

Where the profits escape

If you are using a common oak-tanned belt in your plant, money is being lost at every pulley surface due to slippage and at every bearing due to heat caused by tight belts.

A SHULTZ SABLE RAWHIDE BELT WILL STOP THIS WASTE

Its long life, high co-efficient of friction, pliability and toughness reduce losses to a minimum. Sable belts transmit from 25 to 33 per cent. more power than oak-tanned belts and are longer lived. Send for our Booklet "No. 32."

SHULTZ BELTING COMPANY

ST. LOUIS, MO.

New York Boston Philadelphia

HOWSON & HOWSON

Attorneys at Law Solicitors of Patents

West End Building, 32 South Broad Street

Philadelphia

New York, 38 Park Row Washington, 918 F. Street

TRADE MARK REGISTERED IN **NON-FLUID OILS** UNITED STATES PATENT OFFICE

have the QUALITY OF ADHERING TO BEARING SURFACES;—the amount applied is the amount consumed in ACTUAL lubrication. THAT QUALITY insures decided advantages over FLUID OIL. NO WASTE, NO SPATTERING OF FLOORS, BELTING AND MACHINERY, NO REDUCTION OF OUTPUT THROUGH "MILL STAINS."

NON-FLUID OILS

have the QUALITY OF CONSUMING MODERATELY,—they need to be replenished only one third or one half as often as fluid oil in such places as necks of rolls, on ring spinning and mule [illegible] speeders, drawing frames etc.

In COMB-BOXES OF CARDS they last five times as long as fluid oils and do not spatter on card clothing and drawing cans.

FEED FROM OIL CANS ONE DROP AT A TIME. Where ONE drop is needed ONE may be applied. It lasts longer than THREE of fluid oil because it STAYS THERE—not because it is of heavy density like greases, but because it is viscous and adhesive—made so by special refining.

Remember that genuine Non-Fluid Oils are labeled with above trade mark. Write us attached coupon for free trial sample.

Originators and Sole Manufacturers,

New York and New Jersey Lubricant Company

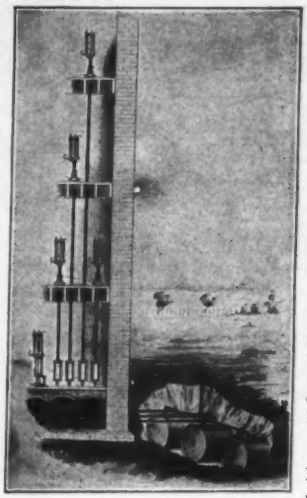
155 Broadway New York City, N. Y.

N. Y. & N. J. Lubricant Co., Dept R.
165 Broadway, N. Y. City:
Please send me free sample of NON-FLUID OIL for trial on

.....
(State specifically where you desire to make test.)

Firm Name.....

Address .....



An Installation like this will reduce your fire risk.

Your oil room, with its oil soaked floors and barrels, is a regular fire trap. What a fine starting point for a disastrous fire! And you are likely to get it, too, sooner or later, unless you improve the situation.

The Bowser System of Oil Storage.

Will give absolute safety. No matter how much oil you have on hand, or what kind it is, it can never be the source of fire when stored the Bowser way.

Send for "Textile Booklet 26." It will be worth your while.

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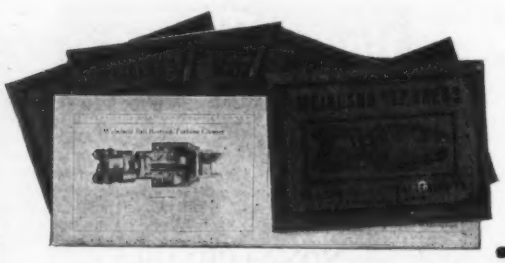
141 Milk St., BOSTON. 50 Church St., NEW YORK. Fisher Bldg., CHICAGO. 612 Howard St., SAN FRANCISCO. 66-68 Frazer Ave., TORONTO.



IT WILL PAY YOU

to send for a copy of our new catalogue. You will find described there the tube cleaner which will most satisfactorily meet your conditions. Our motto is

"THE RIGHT CLEANER IN THE RIGHT PLACE"

We make all kinds of tube cleaners, and would be glad to give you unbiased advice as to the one best suited to your conditions.
All of these cleaners are fully described in our new Catalogue "J."

The Lagonda Manufacturing Co.

SPRINGFIELD, OHIO

Manufacturers of Weinland Tube Cleaners, Lagonda Reseating Machines, Tube Cutters, Cut-off Valves and Specialties.

NEW YORK, PHILADELPHIA, PITTSBURG, CHICAGO, SAN FRANCISCO, ST. LOUIS, ST. PAUL, TOLEDO, LONDON

Mica Flake Lubricant

Reduces Friction, Cools Hot Journals While Running, Saves Oil

Mixed with lubricating oil or grease, the MICA FLAKE actually separates the two metal surfaces of the Journal and axle—keeps them apart, thus prevents the film of oil becoming destroyed or consumed so quickly,—prolongs the life or efficiency of the oil,—reduces friction,—decreases oil consumption 40 per cent.

HERE'S A FAIR OFFER

Why Not Take Advantage of It?

Send us order for a can on trial for thirty days. If not satisfactory, return at our expense and your obligation ceases. . . . .

Packed in 25, 10 and 5 pound cans and 100 pound sacks.

GUARANTEED SATISFACTORY

Pure, white and clean. Will not damage or soil.

Manufactured Exclusively by the

UNITED STATES MICA COMPANY

238-240 LA SALLE STREET, CHICAGO

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You've Got to use some Lubricant. Then isn't a little investigation on the subject worth while?

Do you know that Dixon's Flake Graphite absolutely prevents abrasion?

Intense heat has no effect upon it, neither has intense cold.

Acids or alkalies do not alter Dixon's Flake Graphite in any way.

Oil or grease alone caanot stand any such tests as Dixon's Flake Graphite easily meets.

That's why engineers and machinists use Dixon's Flake Graphite in their work--it does what no other lubricant can do.

Write for free sample 34-C

JOSEPH DIXON CRUCIBLE CO.

Jersey City, N. J.

WHITE STAR GATE VALVE

The same features of construction in bonnet and body are found in the POWELL WHITE STAR GATE VALVE as are found in the POWELL WHITE STAR GLOBE VALVE.

The discs are made of our Powelium white bronze composition which gives better service than ordinary bronze composition. The Ball and socket back on discs combined with the double forcing collars on stem insure tight closing and easy opening without unnecessary force.

Our catalogue page 122 describes it fully. A copy is waiting for your name and address

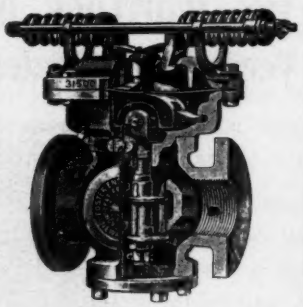
THE WM. POWELL CO.

DEPENDABLE ENGINEERING SPECIALTIES.

CINCINNATI

ALL SOUTHERN JOBBERS CAN SUPPLY YOU.

Foster Valves



WE look upon the installation of a pressure regulating valve, that is not assuredly, positively and absolutely reliable, as something it would have been better to have left undone.

Ask us about our Class W high pressure regulator--what we claim and others say, or for that matter, about any or all of our valve specialties, low pressure regulators, back pressure valves, free exhaust valves and automatic non-return stop valves, float valves, fan and engine regulator pump governors.

Foster Engineering Company,

NEWARK :-: NEW JERSEY.

Room 304, No. 40 Dearborn St., Chicago, Ill. 601 Harrison Building, Philadelphia, Pa. S. S. Stewart, 1245 Park Building, Pittsburg, Pa.

Stock Carried at

50 and 52 S. Canal St., Adkins, Young & Allen Co., Chicago, Ill.

NASON STEAM TRAPS

"Class B," "Class C," "Sidelug"

"Class B"

"Class B" Traps

are designed for low pressure conditions, where the pressure is not higher than 20 lbs. nor lower than 1 lb. Its construction embodies the "Nason" principle in every detail.

"Class C"

"Class C" Traps

are designed for ordinary conditions where the pressure is not higher than 70 lbs. nor lower than 20 lbs. It is identical with "Class B," except in valve area.

"Sidelug"

"Sidelug" Traps

(Patented)

are designed for high pressure conditions to 150 lbs., with a low pressure range to 40 lbs. This trap is extra heavy and cover is reinforced over ports with extension lugs, preventing blowing out of gaskets.

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Tanks, Stacks, Stand Pipes and Sheet Iron Work: Shafting, Pulleys, Gearing, Boxes, Hangers, etc. Mill Castings, Cast every day; work 200 hands

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ATTACHED TO ANY TYPE OF BOILER OR BUILT FOR INDEPENDENT FIRING

Increase Capacity and Permanent Efficiency of Steam Turbines.

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OF ALL TYPES

Write us for prices on any kind of plate or sheet iron work.

HIGH GRADE WORK ONLY

The Babcock & Wilcox Co.

85 LIBERTY ST., NEW YORK

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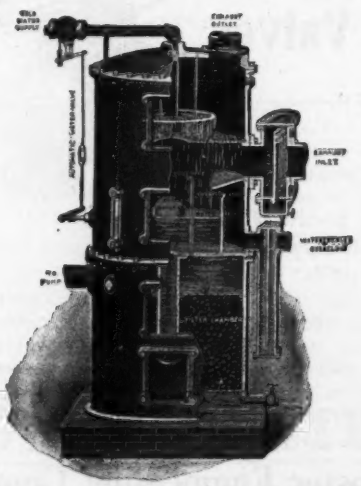
WATER TUBE BOILERS

Steam Superheaters,

Mechanical Stokers

Works: BAYONNE, N. J., BARBERTON, OHIO.
ATLANTA OFFICE: 1132 Candler Bldg.

THE WHITLOCK OPEN EXHAUST Feed Water Heater and Purifier



Perfect Oil Separation. Easily Cleaned. The Highest Possible Temperature in the Feed Water.

Manufactured by

THE WHITLOCK COIL PIPE CO. HARTFORD, CONNECTICUT

New York Office—Singer Building, 85 Liberty Street

(1)

The Babcock & Wilcox Company

85 Liberty Street, New York City

An Announcement

In the early seventies Babcock & Wilcox (doing business at that time as a co-partnership) built the first water tube boilers with sinuous headers under the patent issued to George H. Babcock and Stephen Wilcox, February 18th, 1873. This boiler was a long step in advance of most others at the time of its inception in that the use of stay bolts was eliminated entirely in its construction. With only minor variations this boiler has been built continuously up to the present time and is unquestionably the most successful water tube boiler ever designed. The first of these boilers was built with cast steel headers and the use of these headers continued for four years until 1877.

Their experience with hollow steel castings was so unsatisfactory, the soundness of the castings being so uncertain a quantity, that at this latter date they substituted cast iron for cast steel as a more reliable, uniform and homogeneous metal for boiler headers for moderate steam pressures. At the same time they began a series of long and costly experiments which resulted in the development of the **BABCOCK & WILCOX WROUGHT STEEL SINUOUS HEADER** for higher pressures,--a form of construction unquestionably superior to any other ever devised for high pressure boilers.

Three years ago when we first began to make the A. & T. boiler, built previously by the Aultman & Taylor Machinery Co., it was with the expectation of immediately making the logical improvement in the construction of this boiler to be obtained by the substitution of wrought steel headers for the cast steel headers that had been used in these boilers under the trade name of "flowed" steel.

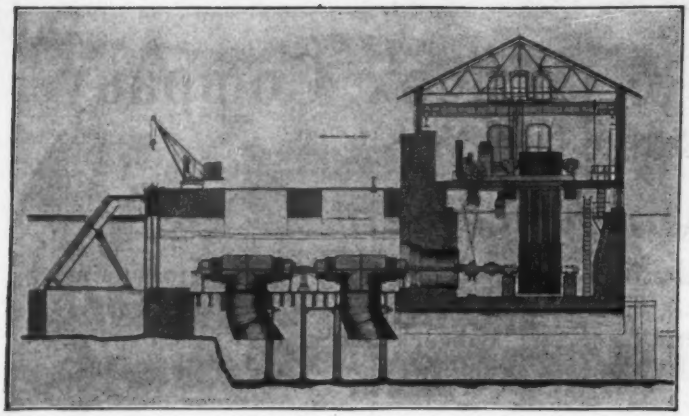
The demands made upon us by reason of the large volume of business which we were doing at that time delayed this change, but at the same time afforded us an opportunity of thoroughly investigating the use of and results obtained from cast or so-called "flowed" steel headers identical with those used by the Aultman & Taylor Machinery Co. and finished for the boiler by much the same organization and the same methods employed by them.

The result has so thoroughly confirmed our opinion as to the superiority of wrought metal for this purpose that we have decided to use only **WROUGHT STEEL SINUOUS HEADERS** as a standard, in any of the horizontal boilers manufactured by this Company, designed for pressures exceeding 160 pounds.

In order to reach this result at as early a date as possible, we have for sometime past discontinued the purchase of any cast steel headers, and we now offer boilers with headers of this material, made from our existing stock, at a reduced price until such time as the stock has been exhausted.

THE BABCOCK & WILCOX COMPANY.

New York, September 1, 1909.



TWO PAIRS

McCormick Turbines

DELIVERING 1400 H. P.

Through ropes to a generator in the power plant of the Lynchburg Traction and Light Co., Lynchburg, Virginia.

"42,000 H. P. in vertical shaft turbines now in course of construction for operation of 10 umbrella type generators in power plant of the Chattanooga and Tennessee Co."

S. Morgan Smith Co.

Manufacturers of Water Wheels, Power Transmitting Machinery, Head Gate Irons, Flume Work.

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BOSTON OFFICE: . 176 Federal Street
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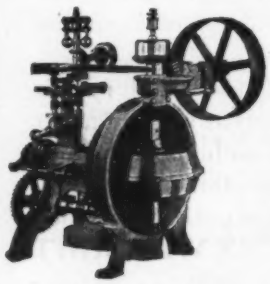
Correspondence Solicited.

The Woodward Compensating Water Wheel Governor.

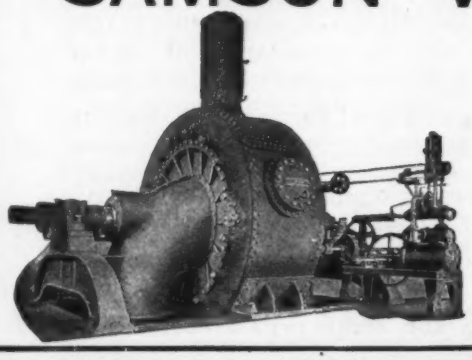


Is no experiment, as 1500 are in use regulating textile mills, paper mills, electric light and power transmission plants, The users will tell you how good they are. Tell us about your needs and ask us to send you our 1908 catalogue and the names of some users near you.

Woodward Governor Co.,

Rockford, Ill.

SAMSON WATER TURBINE



The illustration shows the large NIAGARA design, HORIZONTAL SHAFT TURBINES recently installed by us for the TELLURIDE POWER TRANSMISSION CO. power station, Logan, Utah. Tests conducted by competent engineers developed as follows:

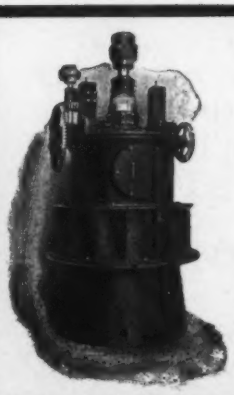
Head	Gateage	Speed	H. P.	Generator Eff'cy	Turbine Eff'cy
211 5 ft.	½	400 r p. m.	1038	95.20%	73.80%
209.7 ft.	¾	400 r p. m.	1560	96.50%	83.59%
208.9 ft.	Full	400 r p. m.	1677	96.70%	80.57%

These results have never been equaled by any turbine of the Horizontal Shaft Design, operating under equally HIGH HEADS. The test was made AFTER TURBINES WERE INSTALLED, direct coupled to Generators. Francis' weirs and formulae for discharge were used. The original test reports on file at our offices. These turbines are all fitted with o r SAMSON BALANCE GATES. Note especially the UNIFORM SPEED at ALL GATEAGES.

JAS. LEFFEL & CO.

299 Lagonda St. - - Springfield, O.

NEW AMERICAN TURBINES

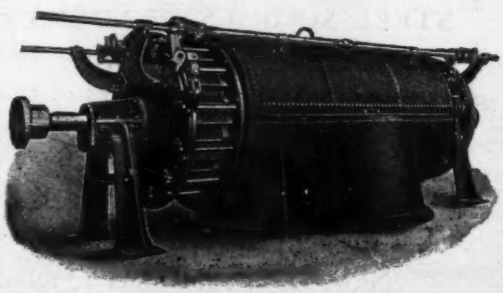


ARE BUILT IN SIZES AND TYPES OF SETTINGS

TO MEET ANY REQUIREMENTS

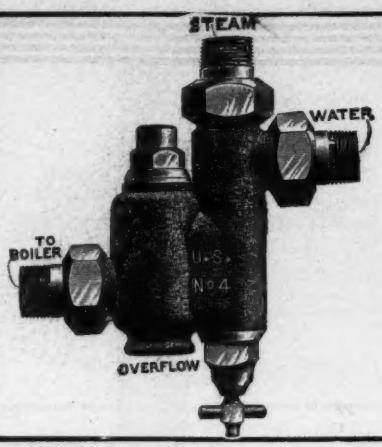
NO DEVELOPMENT IS TOO LARGE OR TOO SMALL FOR US AS OUR LINE IS COMPLETE

SEE CATALOG 31



The Dayton Globe Iron Works Co.,

DAYTON, OHIO.



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200,000 Satisfied Engineers
Endorse the U. S. Automatic Injector, the best on the market. "Enough Sed."
THE
MOON AUTOMATIC GREASE CUP
Can not be beaten as a clean and satisfactory Engine Equipment
Manufactured By
AMERICAN INJECTOR CO.
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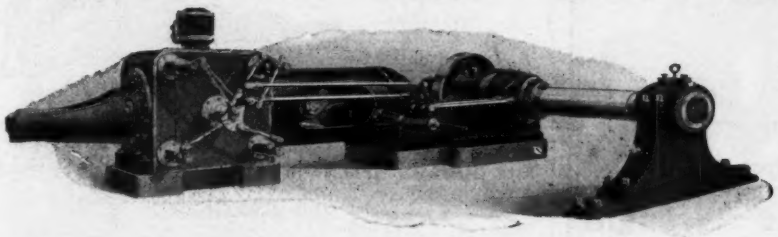
P. S.—Send for our little red Engineers' books. Free for the asking

The Perfect High Speed Corliss Engine

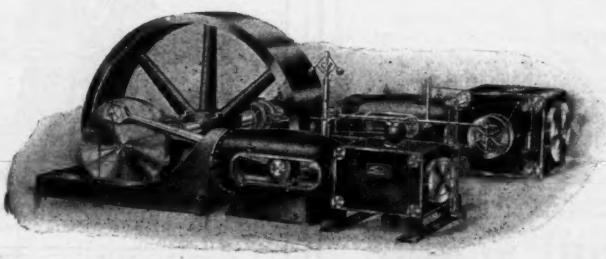


We build the only Corliss Engine ever designed possessing every feature of value common to both releasing and non-releasing types. We are able to secure continuously and under all conditions of load, as quick a cut-off and valve opening as can possibly be obtained from the best releasing gear. Our valve travel never varies, and piston speeds up to 900 feet are common to our engines. Catalog? It's free.

Clark Bros. Company, - - Belmont, N. Y.

"Will Your Engine Do My Work Better Than Any Other Engine?"

THAT'S WHAT YOU WANT TO KNOW



THAT'S WHAT WE WANT TO SHOW

Now give us the details of your Requirements.
We build the HARDIE-TYNES for every service.

Hardie-Tynes Manufacturing Company

Builders of Corliss and Slide-Valve Engines, Air Compressors, Hoisting Engines, and Complete Power Plants for Every Purpose.

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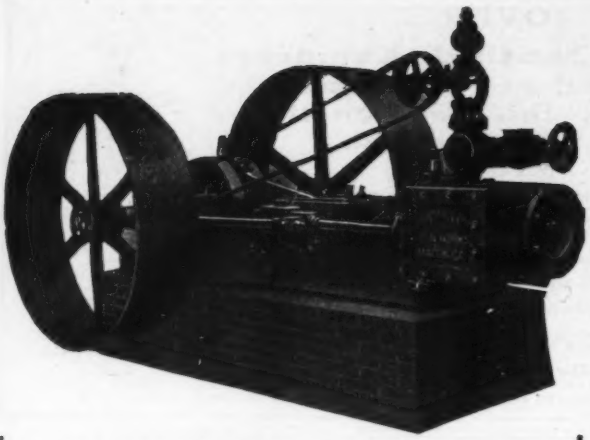

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our products cover the most comprehensive line of **Pumps and Hydraulic Machinery** in the world. We can meet any condition of service, capacity or working pressure reducing the cost of operation to a minimum. Goulds Pumps when driven by belt or direct connected to Electric Motor, require practically no attention and when working under most conditions can be operated entirely automatic. Catalog sent on application.

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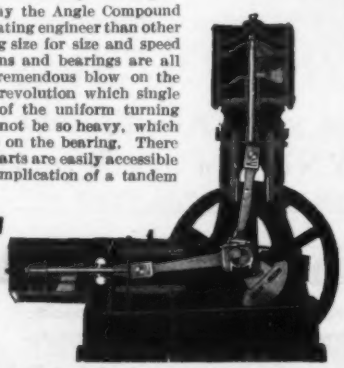
The American Ball Angle Compound Engine

was designed first, to secure perfect balance. Second, to give a superior economy which follows compounding. Third, to save space, and fourth, to secure a more even turning moment.

One of the incidental benefits has been to produce an engine that has no dead centers. One cylinder being at right angles to the other, the engine can be started by the steam from any position. You do not need to bother about stopping the engine in the right position, nor do you need any special tools to get it into the right position to start. It is always ready.

There are further reasons why the Angle Compound gives less trouble to the operating engineer than other types of engines. Comparing size for size and speed for speed, the pressure on pins and bearings are all smaller. There is not the tremendous blow on the main bearings twice in each revolution which single engines produce. Because of the uniform turning moment, the fly-wheel need not be so heavy, which likewise reduces the pressure on the bearing. There are only two valves and all parts are easily accessible in contrast to the crowded complication of a tandem compound.

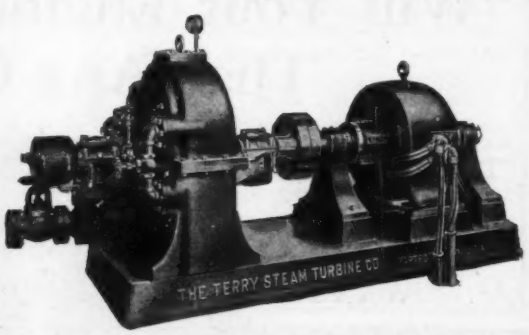


If you are interested in a new engine, it will be worth your while to write for our new Bulletin

AMERICAN ENGINE COMPANY

47 Raritan Avenue **Bound Brook, New Jersey**

TERRY TURBINES



150 k. W. Turbine Generator, 1,650 r. p. m., 125 volts

These sets are built in sizes from 5 to 300 k. w. They run without noise or vibration, are light weight and take small floor space. No oil in steam. 275 Turbines, totaling over 20,000 horse-power, are in use throughout the country, driving direct connected without gears, Generators, Circulating and Boiler Feed Centrifugal Pumps and Forced Draft Fans.

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The Terry Steam Turbine Co.

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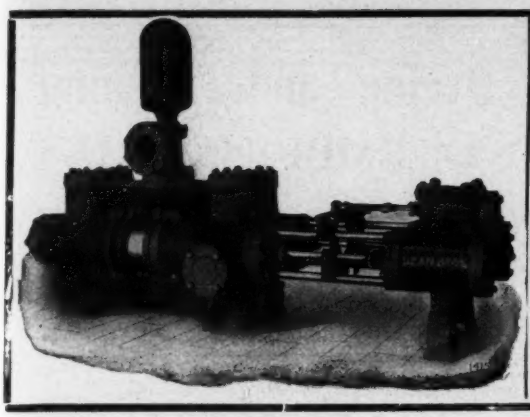

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JET AND SURFACE **CONDENSERS**

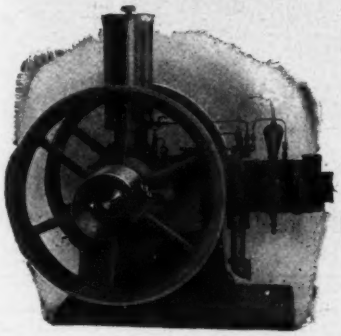
STEAM, ELECTRIC AND BELTED PUMPS.

Forged Steel Hydraulic Pressure Pumps.

DUPLEX and SINGLE pumps

For feeding boilers, water supply.
Fire Protection and all purposes

Mietz & Weiss Oil Engines.



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2-200 H. P.

75,000 H. P.

In Operation.

USED FOR ALL POWER PURPOSES.

Operated on

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Simple, Safe, Reliable, Durable and Economical.

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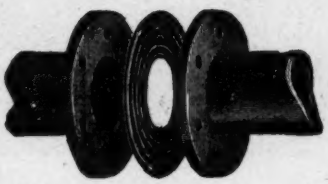

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REVERE RUBBER CO.—"GIANT" Seamless and Stitched Rubber Belt.
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A COMPLETE LINE OF MILL SUPPLIES.

CHARLESTON, SO. CAROLINA.

$100 IN CASH

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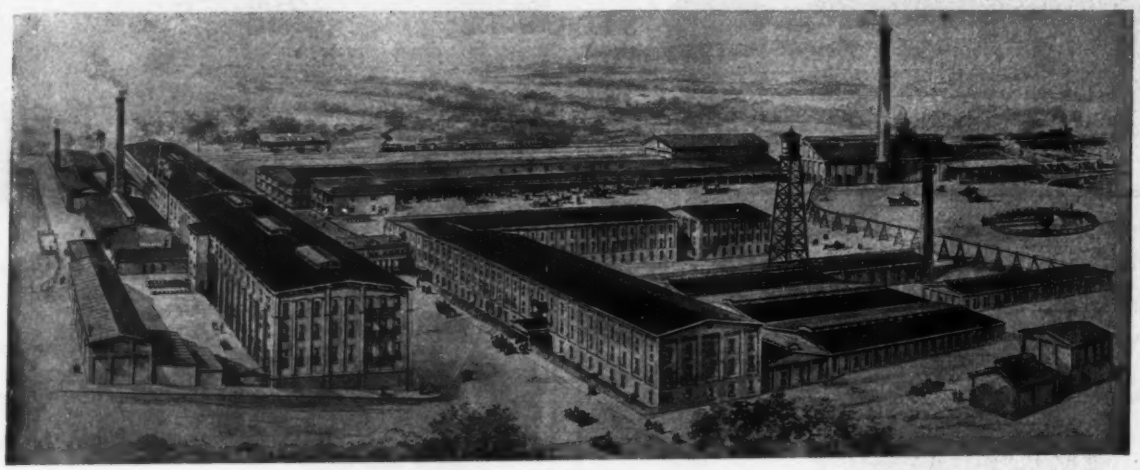

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For dyeing, bleaching, and finishing plants.

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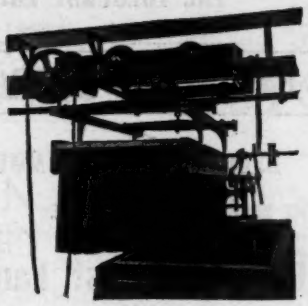

The Essential Requisite of the Fabric Buyer is Perfect Dyeing and Non-Fugitiveness of Color After an Exposure Test of Textile Fabrics.

Buyers are far more discriminating than they used to be, Rogers, Peet & Co., Brokhaw Bros., and dozens of other high-class clothing firms are applying the exposure test to cloth.

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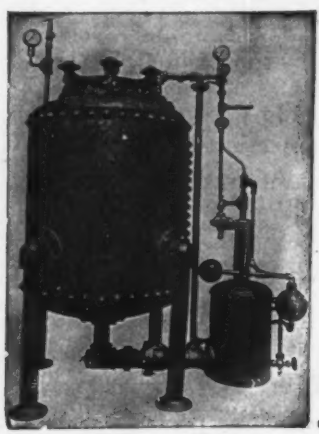

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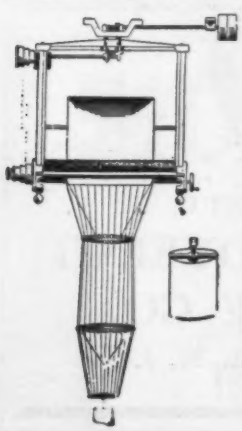

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This Illustration is of the

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This machine is entirely of new design and when properly handled will bring the stripe and wale of the cloth perfectly straight on any kind of tubular fabric. It combines strength, durability, ease of operation, Economy of Space and Power, and does more and better work than any other machine on the market.

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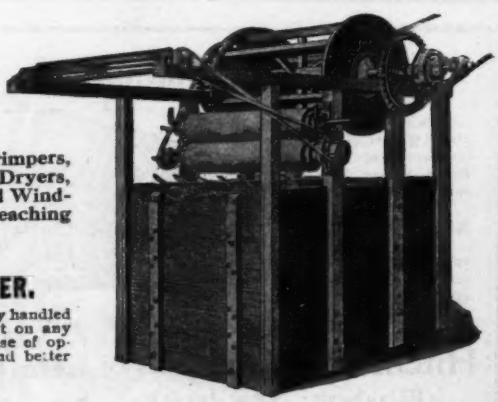

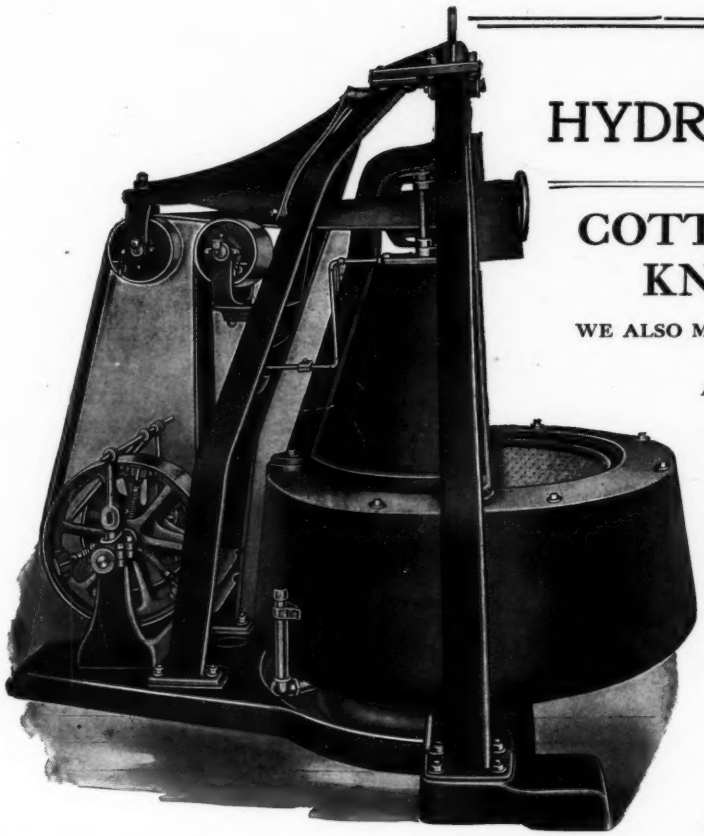

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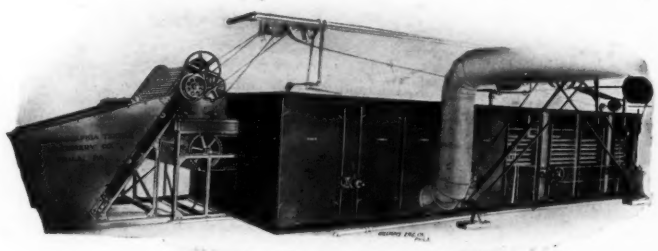

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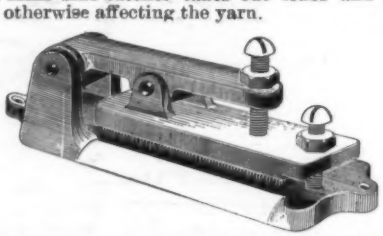
The Mills' slub catcher takes out slubs and bunches without otherwise affecting the yarn.



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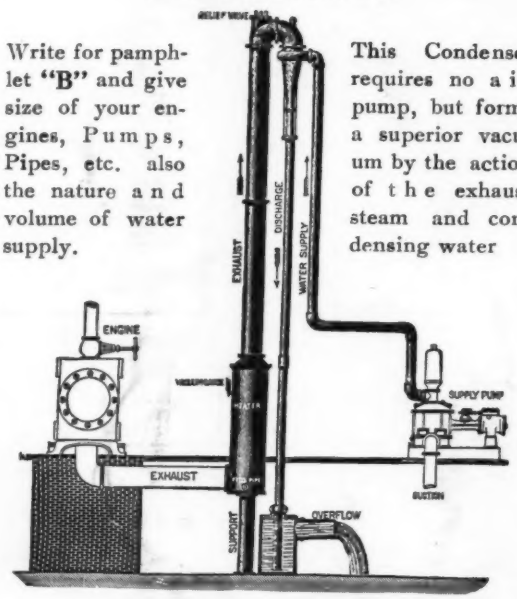

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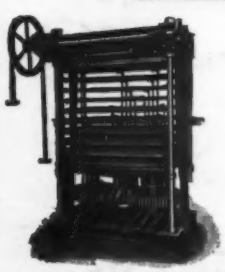

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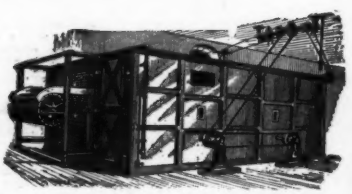

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